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THIRTY-FIFTH ANNUAL REPORT

OF THE

STATE DEPARTMENT OF HEALTH

OF

NEW YORK

For the Year Ending December 31, 1914

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VOLUME II

Report of the Sanitary Engineering Division

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STATE OF NEW YORK

No. 57

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FEBRUARY 1, 1915

THIRTY-FIFTH ANNUAL REPORT

OF THE

STATE DEPARTMENT OF HEALTH

STATE OF NEW YORK,
EXECUTIVE CHAMBER,
ALBANY, *February* 1, 1915

To the Legislature:

I have the honor to transmit herewith the thirty-fifth annual report of the State Commissioner of Health for the year 1914.

CHARLES E. WHITMAN

41214

NEW YORK STATE DEPARTMENT OF HEALTH

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Attending Physician, German Hospital

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Principal Assistant Engineer	H. Burdett Cleveland
Assistant Engineer	Charles A. Holmquist
Assistant Engineer	E. Sherman Chase
Assistant Engineer	Clarence M. Baker
Assistant Engineer	Morton F. Sanborn
Inspecting Engineer	Charles A. Howland

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REPORT OF THE CHIEF ENGINEER

Albany, *December* 31, 1914

Hon. Hermann M. Biggs, M. D., LL. D., *State Commissioner of Health, Albany, N. Y.:*

Dear Sir.— I have the honor to submit herewith the Annual Report of the Division of Sanitary Engineering for 1914.

In my last annual report attention was called to the marked increase in work which the records of the Division indicated had been performed in 1913 as compared with previous years. That this was not merely incidental or unusual is obvious from the still greater increment in the work performed in 1914, amounting to some 16 per cent. over 1913, and 30 per cent. over 1912. Owing to limited appropriations the resources of the Engineering Division have always been taxed to their limit and the increased volume of work in 1914 was only made possible through the employment of two additional assistant engineers and two additional stenographers to the regular staff which now comprises the chief engineers, principal assistant engineer, four assistant engineers, one inspecting engineer and four stenographers.

During the year a few important changes in the nature of methods of work were instituted and certain additional work undertaken, all with a view of increasing the efficiency of the work as a whole and of adjusting the work more advantageously to that of the newly organized division of Sanitary Supervisors, with whom the engineers frequently come in contact. Thus, most of the important work of inspection of sanitary conditions of summer resorts which has heretofore been performed by the Engineering Division was transferred almost entirely to the Sanitary Supervisors, the Engineering Division acting merely in an advisory capacity when called upon. The same applies in a general way to the investigation of local nuisances. Again it was found necessary in order to meet the demands of Institutional and State authorities, to extend the work of inspection of sanitary conditions of State institutions which had previously been confined to the few institutions reporting to the Fisca Supervisor of State Charities, to include all of the institution of the State, as provided for in recent amendments to section 1 of the Public Health Law. Still again, it was deemed import ant to obtain more definite and complete information concernin the efficiency and effects of operation of the many municipal an institutional sewage disposal plants in the State and a special in vestigation was instituted to secure this information and wa carried on during the remainder of the year. These two ex tended fields of investigation were assigned to the two additiona assistant engineers above referred to.

During the year 1914 some 2,736 pieces of correspondence wer referred to the Engineering Division for consideration, requirin in all cases careful study and for their proper disposition the is suance of some 4,100 letters, reports or other communications The more important of these may be enumerated as follows:

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In addition there were held during the year some 408 con ferences with public officials and private individuals in connec tion with the above or other matters and there were delivered b the chief engineer or other members of the staff some eight lec tures upon sanitary engineering subjects at public meetings o in connection with educational work.

The progress chart which has been presented with my thre last annual reports, showing graphically the work of the Engi neering Division since 1907, has been extended to include th year 1914, and is again presented. This chart shows the volum of work by months according to its classified subdivisions, and by means of it may be seen at a glance the monthly and seasonal dis tribution or variation of the work during this period, and a com parison of the work of 1914 with previous years. A more de tailed description of the chart, its method of interpretation and use, and its value as a comparative statistical record was fully described and discussed in my report for 1911, and may be found in the annual report of the Department for that year.

The material comprising this annual report of the Engineering Division is presented in the following pages and has been arranged and indexed in accordance with the classification uniformly adopted for all records in the Division and is the same as that used in previous annual reports.

Respectfully submitted,

THEODORE HORTON

Chief Engineer

SEWERAGE AND SEWAGE DISPOSAL

EXAMINATION AND APPROVAL OF PLANS FOR SEWERAGE AND SEWAGE DISPOSAL

The examination of plans for sewerage and sewage disposal for municipalities under the provision of the Public Health, Village and Town Laws, which require that all such plans be submitted to this Department for approval before construction may be undertaken, comprises one of the more important routine duties of the Engineering Division. Plans for new sewerage and sewage disposal systems are carefully studied not only with reference to the details of the design and the adequacy of these systems but also with respect to the location of the outlets and the extent of the treatment of the sewage in order that not only the municipalities themselves but lower riparian owners and municipalities may have their public water supplies properly protected and free from any nuisance arising from sewage pollution.

During the past year some 89 sets of sewer plans have been examined and reported upon and a considerable number of these plans have had to be returned for modification and correction before final approval. The cost of the sewer systems and the sewage disposal plants provided for by these plans approved during the past year represents an expenditure of approximately $3,000,000. The cost to the State of examining and reporting upon these plans amounting to about one-tenth of one per cent, is a very low insurance rate as it were, to guarantee designs which will be adequate and economical in construction and operation and satisfactory in regard to the protection of public health.

During 1914 plans for sewers and sewer systems and sewage disposal works were examined and reported upon and approved in the cases of the following municipalities:

AKRON

On February 4, 1914, approval was given for the temporary omission from construction of certain portions of the general system of sewers and sewage disposal, village of Akron, as follows:

That portion of the sewers planned for Jackson street lying west of the crossing of the West Shore railroad.

All of that portion of the sewers planned for the east side of Buell street lying south of a point 1,250 feet northerly from the center line of Clarence road, as laid down upon the map and plans of the said sewer system.

All of that portion of the sewers planned for the westerly side of Buell street from a point south of the center line of Chestnut street.

ALBANY

Detailed plans for the main intercepting sewer, and general plans for pumping stations and grit chambers and plans for the interception of the sewage now discharged into Patroon's creek were approved on March 18, 1914.

It was pointed out to the city authorities at the time of the approval of these plans that it was expected that detailed plans for pumping stations and grit chambers would be submitted to this Department for approval before their construction is commenced. The report on the examination of the plans follows:

Detailed plans for the intercepting sewer and appurtenances, general plans for pumping stations and grit chambers, and plans for the interception of the sewage now discharged into Patroon's creek were recently submitted to this Department for approval by the City Engineer in compliance with the requirements of a permit granted to the City on January 15, 1913.

General plans for a proposed intercepting sewer and detailed plans for a sewage disposal plant to care for the dry weather flow of sewage of the city of Albany were approved on January 15, 1913, and the permit issued in connection with the approval of these plans contained, in addition to the usual revocation and modification clauses, the following conditions:

> 1. That detailed plans of the main intercepting sewer, regulating chambers, overflow connections and appurtenances and of the pumping stations and grit chambers and their appurtenances shall be submitted and approved before any portions of the intercepting sewers and sewage disposal works are constructed.
>
> 2. That the capacity of the section of the main intercepting sewer between Arch street and Gansevoort street shall be increased sufficiently to care for the estimated ultimate contribution of sewage tributary to this section.
>
> 3. That detailed plans showing the method and arrangement for the collection or interception of the sewage now discharged into the Beaver creek and Patroon's creek sewers shall be submitted and approved before any portions of the main intercepting sewer and sewage disposal works are constructed.

From our careful examination of the plans recently submitted it is found that, except for the required detailed plans of pumping stations and grit chambers, all of the requirements stipulated above have in general been complied with. With respect to the plans for pumping stations and grit chambers only general plans of those structures have been submitted. The report of the City Engineer accompanying the plans states that the details of the main pumping station have not been finally worked out inasmuch as the motive power to be used to drive the pumps will depend upon the location of the city refuse disposal plant and that detailed plans will be submitted for approval at a later date.

The proposed main pumping station and grit chambers are to be located on Westerlo island adjacent to the disposal works. One of the plans submitted shows a cross-section of the grit chambers, main pumping station and a portion of the force main to the disposal works and contains a note stating that details of pumping station, screens and grit chambers are to be submitted to and approved by the State Department of Health before constructing the same. It appears from the report of the City Engineer that the grit chambers are to be divided into two compartments so arranged that either or both compartments may be operated at one time. The chambers are to be designed to give a detention period of about one and a half minutes and a velocity of about one foot per second. It is intended that only the heavier mineral matters carried down by the intercepting sewers shall settle out in the grit chambers. It is planned to clean these chambers by means of a grab bucket operated by an electrically driven locomotive crane.

It is also planned to install inclined bar screens at the outlets of the grit chambers to protect the pumps. These screens are to be cleaned by hand.

It appears from the report of the City Engineer that it is proposed to install submerged centrifugal pumps in the main pumping station which pumps are to be driven either by electric motors or by direct connected steam engines. The pumps are to operate against a static head of about 27 feet and will be designed to care for the full discharge of the intercepting sewer, namely 65,000,000 gallons, with one unit in reserve.

The bottom of the pumping station and screen chamber will be several feet below mean low water in the river and it is planned to provide against flooding these structures by filling in around the pumping station to an elevation of 11 feet above the present surface of the ground and by constructing a dike around the grit chamber to the same elevation.

As in the case of the main pumping station just described the booster station to handle the sewage in Broadway north of Patroon's creek is not shown in detail but a note on the plans states that details of this station are to be submitted to and approved by this Department before the construction of it. According to the City Engineer's report, this pumping station, which is to be located on the west side of Broadway near Patroon's creek, is to be equipped with electrically driven and automatically operated submerged centrifugal pumps having sufficient capacity to handle an amount somewhat in excess of the present day weather flow of sewage with one unit in reserve. Provisions are to be made for future extensions of the plant. The pumps will operate against a head of about 12 feet.

Detailed plans of the proposed intercepting sewer show that this sewer has been changed in both cross section and alignment. The sewer shown by the general plans approved was planned with a circular section for all sizes. The proposed sewer shown by the detailed plans now submitted is designed with horseshoe sections for sizes from 42" to 66" inclusive and with modified rectangular sections for sizes from 24" to 36". The capacity of the proposed sewer is practically the same as originally planned except that the capacity of the section between Arch and Gansevoort streets has been increased in accordance with the recommendations and requirements of this Department.

With reference to the change in the alignment of the proposed intercepting sewer it is found that this sewer as shown by the original plans was to be located in Broadway between Hudson and Fourth avenues. It is now planned to run this portion of the interceptor in Dallius street and Dongan avenue, so that this section will be located from four to five hundred feet west of the sewer as originally planned. The greater portion of this section of the sewer will, however, be lower than with the route first selected and its crown will be located at a depth of from 10' to 17' below the ground surface which should permit of running short lateral sewers back from the river front to the main interceptor as proposed.

The new location of the interceptor leaves a considerable area between this sewer and the river front which is at present served by the combined sewers below the points of interception. It is proposed to care for the sanitary sewage of this area between Madison avenue and Gansevoort street by short 12" sewers extending back from points near the river to and discharging into the interceptor. It appears however that it is not proposed to construct these lateral sewers at present.

The plans for the proposed regulators for controlling the flow of sewage discharged into the intercepting sewer show that these regulators have been designed along the lines indicated by the general plans already approved in that it is proposed to control or operate these regulators by the flow of sewage in the combined sewers and not by the flow in the intercepting sewer as is the usual practice. The regulators, which are in general to be placed near the intersection of the proposed intercepting sewer and the existing combined sewers, consist of rectangular manholes divided by means of partition walls into a central valve chamber and two float chambers which contain the floats for operating the valves at the inlets of the regulator. The regulators are connected with the proposed intercepting sewers and the exising combined sewers by means of pipes varying in size from 8" to 24" in diameter through which the dry weather flow of sewage is to be discharged into the interceptor through the regulators. The sizes of the connections depend upon the size and capacity of the sewers to be intercepted.

It is proposed to construct dams across the bottom of the combined sewers from which sewage is to be intercepted by means of which all of the dry weather flow of sewage is to be diverted to the interceptor through pipes leading from the inverts of the lateral sewers to the regulating chambers. The valves in these chambers are to be so set as to permit the maximum dry weather flow in the combined sewers to enter the interceptor. During storms or at times of back water in the combined sewers due to high water in the river, sewage is to be admitted to one of the float chambers of each regulator through so-called tell-tale pipes from 3 to 4 inches in diameter and over adjustable weirs, the size of the pipes depending upon the size of the regulator. The two float chambers of each regulator are connected with a pipe located at the bottom of each chamber by means of which the sewage in both chambers will be maintained at the same level. The rising of the water or sewage in the float chambers will cause the floats to rise and through the lever arms connecting the floats and the regulator valve automatically close these valves at the inlet ends of the regulating chambers. The excess flow of sewage into the float chambers will be discharged into the valve chambers and interceptor through two-inch adjustable siphons. As the level of the sewage in the combined sewers subsides the sewage in the float chambers will be drawn off by means of the same small siphons, causing the floats to settle and automatically open the valves.

As noted above, the proposed regulator differs from the usual variety or so-called Boston type of regulator in that it is to be operated or controlled by the flow of sewage in the combined sewers and not by the flow in the interceptor. Although the proposed regulators may meet certain local requirements and have certain hydraulic advantages there are practical disadvantages which might offset the advantages gained from a hydraulic standpoint.

The principal objections or disadvantages of the proposed type of regulators are the difficulty of properly adjusting the ratio of the lever arms operating the regulating valves should such become desirable or necessary, the uncertainty of successful operation of the siphon at all times, the question of silting up of the float chambers and the consequent necessity for increased maintenance following storms. I do not believe, however, that the objectionable features of the proposed regulator are sufficiently serious to warrant our disapproval of it, but it is suggested that if possible, one of these regulators be installed at once on one of the existing sewers in order to try out its successful operation under actual conditions.

According to the plans it is proposed to intercept the dry weather flow of sewage of the Beaver creek sewer at Arch street by means of a double regulating chamber having two 24-inch valves. This follows out one of the alternate recommendations embodied in our report on the examination of the general plans dated December 23, 1912, which suggested that the Arch street sewer (Beaver creek) might be connected directly with the main interceptor by means of a regulator and this appears to be a satisfactory solution of the problem in view of the comparatively small drainage area of Beaver creek.

The plans for the interception of the sewage discharged into Patroon's creek are general and show that it is proposed to extend the existing sewer in Tivoli street along Patroon's creek to a point about one-half mile northwest of the intersection of Central avenue and Russell road, a distance of about three miles. This sewer, although not shown in detail, is to vary in size from 30 inches to 60 inches in diameter, and in connection with proposed lateral sewers is presumably to intercept the combined sewage of both the existing and proposed sewers in the Patroon's creek drainage area, within the city limits. Patroon's creek will then continue to carry off the surface water for the portion of its drainage area outside of the city and from a limited area near the creek within the city. The dry weather flow of the Tivoli sewer to which the proposed sewer is to be tributary is to be discharged through a 24-inch regulator into the upper end of the proposed intercepting sewer. These plans follow out the recommendations of this Department of either extending the interceptor or the existing sewers to collect the sewage now discharged into Patroon's creek and appears to satisfactorily meet the local requirements in view of the large drainage area of this stream. Furthermore, since the existing sewers in this district have been constructed on the combined plan in common with the entire sewer system of the city, it does not appear reasonable or economical to require a complete separation of sanitary sewage and storm water in this area.

In conclusion I would state that it is found from our careful examination of the plans that, except for the detailed plans for the proposed pumping stations and grit chambers which are to be submitted later, all of the requirements of the permit issued to the city on January 15, 1913, allowing the discharge into the Hudson river of effluent from the proposed sewage disposal plant to be constructed in connection with the proposed intercepting sewer have been complied with and that the proposed sewers, regulators and appurtenances if properly constructed and maintained with care and efficiency should satisfactorily meet the local requirements.

In view of the above and since detailed plans of the proposed pumping stations and grit chambers are being prepared and will be submitted for the approval of this Department at a later date, before their construction, as noted on the general plans for these structures, now under consideration, I would recommend that the present plans be approved.

ALBANY, N. Y., *March* 12, 1914

ALBION

Plans for extensions and modifications of a portion of the sewer system of the village of Albion and of the Western House of Refuge for Women were submitted for approval on September 16, 1914. These plans were approved on October 6, 1914, and a permit was issued to the sewer commissioners of the village allowing the discharge into the west branch of Sandy creek of effluent from the proposed sewers. The report on the examination of the plans follows:

Plans for extensions and modifications of a portion of the sewer systems of the village of Albion and the Western House of Refuge for Women so as to permit of connecting the sewers of the institution with the village systems were submitted for approval by the board of sewer commissioners of the village on September 16, 1914.

The institution is at present provided with a sewage disposal plant consisting of a screen chamber and a system of artificially aerated filters constructed in 1898. It appears that although this sewage disposal plant operated successfully for a time after it was first installed, it has been the subject of several complaints during the past few years, as a result of which a number of investigations of the condition of operation of the plant with reference to the creation of a nuisance due to odors and to the pollution of the stream into which the effluent is discharged have been made by representatives of this Department. Plans for a new sewage disposal plant consisting of a settling tank and four intermittent sand filters to be located on the north side of the Erie canal and at a considerable distance from the institution were prepared at the recommendation of this Department and approved on May 8, 1912. It appears, however, that the sewage disposal plant provided for by these plans has not been constructed and it is now proposed to connect the institution with the village of Albion sewer system and sewage disposal plant under and in accordance with one of the provisions of chapter 531 of the Laws of 1914, which provides that:

> For the expense of purchasing from the village of Albion the perpetual right to discharge sewage into the sewers of such village the sum of twenty thousand dollars, provided, however, that no part of such sum shall be available until the taxable inhabitants of such village, at an annual or special meeting, shall have authorized the trustees of such village to construct and forever maintain a sewer in West State street in such village, connected with the sewer system of such village and its disposal plant, and to erect a disposal plant and authorizing such trustees to enter into a contract, and such trustees have entered into such contract, with the board of managers of such Western House of Refuge for the perpetual use thereof for sewage disposal. Payment of such sum shall be made by the state treasurer on the warrant of the comptroller on the approval by the attorney-general of the proceedings preceding the execution of such contract and of the form and effect of such contract.

It appears from the plans submitted that the ground near the institution disposal plant is low and that in order to connect with the village sewer system it will be necessary to reconstruct the lower portions of the two outfall sewers of the institution near the existing disposal plant and to modify the sewer in West State street in the village east of King street and extend it to the institution grounds a distance of 1,600 feet. The existing 4-inch sewer on the institution property near West State street extended is to be intercepted at a point about 350 feet west of the disposal plant and a 10-inch sewer with a slope of .2 per cent. is to be constructed from this point to the end of the village sewer extended near the disposal plant. The existing 8-inch sewer south of West State street is to be raised and laid on a slope of .2 per cent. These slopes are not sufficiently steep to provide self-cleansing velocities in the sewers and should be increased in order to prevent clogging. The 10-inch sewer should be increased to not less than .25 per cent. and the slope of the 8-inch sewer should be increased to not less than .35 per cent. or the size of the sewer should be increased to 10 inches in diameter and have a slope of 25 per cent. It appears from the plans that this can be attained by intercepting the existing sewers at points some distance above the proposed points of interception.

The proposed 12-inch sewer extension in West State street from King street in the village is to be laid on a slope of .2 per cent. and will extend to the intersection of the two institution sewers, a distance of 1,680 feet and about 450 feet west of the corporation line. This sewer will be tributary to the 12-inch trunk sewer in West State street east of King street which sewer extends to West street where the size is increased to 15 inches in diameter. The 8-inch sewer in West State street west of King street shown by the plans for sewerage and sewage disposal approved by this Department in 1913 is to be replaced by the proposed 12-inch sewer.

It appears from our examination of the plans that the outfall sewer of the village to which the institution sewers is to be connected will have adequate capacity to care for the additional sewage that will be contributed to it from the institution. With reference to the disposal plant of the village it is found that the settling tank and sludge bed are of adequate capacity to care for the proposed increase in the contribution of sewage. The contact beds, however, after the entire village and institution have been connected with the system will be operated at its maximum capacity and will probably not properly care for the sewage from a population greater than the combined populations of the village and institution. It will, therefore, be necessary for the village to extend or enlarge this portion of the disposal plant at an earlier date than would otherwise have been necessary.

In view of the above I would recommend that the plans be approved and a permit be issued allowing the discharge of sewage from the Western House of Refuge for Women into the West Branch of Sandy creek after such sewage shall first have been passed through the sewage disposal works of the village

of Albion and that the permit contain in addition to the usual revocation and modification clauses the condition that the slope of the proposed 10-inch sewer of the institution be increased to .25 per cent. and that the slope of the 8-inch sewer be increased to .35 per cent. or that the size of this 8-inch sewer be increased to 10 inches in diameter and a slope of .25 per cent. provided for it.
ALBANY, N. Y., *September* 23, 1914

PERMIT

The plans were approved on October 6, 1914, and a permit, containing the following conditions, was issued on the same date:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary.
2. That the issuance of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.
3. That only sanitary or domestice sewage, and no storm water or surface water from streets, roofs or other areas shall be admitted to the proposed sewers.
4. That the slope of the proposed 10-inch sewer on the institution grounds be increased to .25 per cent. and that the slope of the 8-inch sewer shown by the plans be increased to .35 per cent. or that the size of this 8-inch sewer be increased to 10 inches in diameter and this sewer be constructed with a slope of at least .25 per cent.
5. That the village shall at all times provide ample capacity of all parts of its sewage disposal plant to care for the sewage contributed by both the village and the institution and in accordance with the requirements of the State Commissioner of Health and with plans submitted to and approved by him.
6. That all the sewage to be collected by the proposed sewer shall be passed through the sewage disposal plant of the village of Albion.

ALBION (Western House of Refuge for Women)

For report on the examination of plans for a modification of the plans for sewerage and sewage disposal for this institution see Albion, page 19, of this report.

AUBURN

On September 10, 1914, plans for proposed sewers in Arlington avenue, Kensington avenue and other streets in the city of Auburn were approved and a conditional permit was issued to the common council of the city allowing the discharge of sewage from the proposed sewers into Crane brook and on October 2, 1914, plans for proposed sewers in York and North streets were approved and a permit issued allowing the discharge into Troopsville brook and Owasco outlet of sewage from the proposed sewers. The reports and the conditions of the permits issued in connection with the approval of the plans are printed below.

Plans for proposed sewer extensions in the city of Auburn, Cayuga county, were submitted to this Department for approval by the city clerk on behalf of the common council on August 27, 1914.

The city of Auburn is located in the central part of Cayuga county on the Owasco lake outlet, a tributary to the Seneca river. There are also a number of small streams which flow through the village which are either directly or indirectly tributary to the Seneca river. The city is provided with a public water supply taken from Owasco lake and the water works are controlled by the municipality. It is also provided with a sewer system serving the greater portion of the city and discharging into Owasco outlet and other streams which flow through the city.

The records of the Department show that a large portion of the sewer system tributary to the Owasco outlet was constructed between 1883 and 1896 apparently without the approval of this Department.

In 1905 plans for a sewer system and for a sewage disposal plant consisting of septic tanks and contact beds serving portions of the 4th, 5th, 6th and 7th wards in the northwestern part of the city were approved. The effluent from this sewage disposal plant discharges into Troopsville brook, a tributary to Owasco outlet. In 1909 plans for sewerage and sewage disposal for the 1st, 6th and 10th wards, serving the northeastern portion of the village, were approved. This sewage disposal plant, which is now in operation, is similar to that for the other section of the city, and discharges into Hunter brook, which stream empties into the Erie canal near Weedsport. In 1910, 1911 and 1912 plans for comparatively short sewer extensions in the city tributary to Owasco outlet were approved on the condition that whenever required by the State Commissioner of Health satisfactory detailed plans for the interception and treatment of the entire sanitary sewage of the city or of any portions of such sewage not treated by the sewage disposal plants then in operation, shall be prepared and submitted to this Department for approval and that within the time limit stated in such requirements, the construction of any or all works shown by such plans as may be specified shall be completed and put in operation.

The plans now before the Department and under construction show that it is proposed to construct some 5,000 feet of sewers in the southwestern section of the city tributary to the existing sewer which empties into Crane brook, a tributary of Seneca river. This stream drains a considerable portion of the southwestern section of the city and has a drainage area above the point of discharge of the proposed sewers of about 15 square miles. Below this point it flows for a distance of about 12 miles through a comparatively sparsely populated rural district and as far as can be ascertained from the records of this Department it does not appear that any public water supplies are derived from this stream below the point of discharge.

According to the report of the city engineer submitted with the plans it appears that the streets, namely, Arlington, Kensington, Lexington and Elmwood avenues, in which it is proposed to construct sewers, are now served by small private drains which discharge into the existing 12-inch sewer in Genesee street and that these drains were poorly constructed and furnish inadequate sewerage facilities for this section. The proposed sewers are to be 8 inches in diameter and are to be constructed with fairly steep slopes, the minimum slope being .75 per cent. Manholes are to be placed at the upper ends of all sewers and at all street intersections and at intermediate points not more than 400 feet apart.

In conclusion I would state that inasmuch as the section of the city to be served by the proposed sewers is already provided with sewers discharging into Crane brook, the construction of the proposed sewers will not materially increase the amount of sewage discharging into this stream in the near future and I am of the opinion that the sewage may be discharged into this stream without objection at this time. The stream, however, drains a comparatively large section of the city and it is probable that as this district becomes more fully developed it will be found necessary to either treat the sewage of this drainage area in an independent sewage disposal plant located along Crane brook below the city or to divert the sewage from this section of the city to a disposal plant which, owing to the condition of pollution of the Owasco outlet, it will probably be necessary to construct in the near future to care for the sewage which now empties into the Owasco outlet.

I would therefore recommend that the plans be approved and a permit be issued allowing the discharge into Crane brook of sewage to be collected by the proposed sewers and that the permit contain in addition to the usual revocation and modification clauses the same condition with reference to the interception and treatment of the sanitary sewage of the city as contained in the permits previously granted to the city.
ALBANY, N. Y., *September* 2, 1914

PERMIT

The permit issued in connection with the approval of the plans on September 10, 1914, contains the following provisions:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary.
2. That the issuance of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.
3. That only sanitary or domestic sewage and no storm water or surface water from streets, roofs or other areas shall be admitted to the proposed sewers.
4. That whenever required by the State Commissioner of Health satisfactory detailed plans for the interception and treatment of the entire sanitary sewage of the city or of any portion of such sewage not treated by the sewage disposal plant now in operation shall be prepared and submitted to this Department for approval; and that within the time limit stated in such requirement, any or all portions of such sewage disposal works shown by said plans as may be specified shall be constructed and put in operation.

Plans for the proposed sewer extensions and modifications in the city of Auburn, Cayuga county, were submitted to this Department for approval by the City Clerk on behalf of the Common Council on September 28, 1914.

The plans show that it is proposed to construct comparatively short sewer extensions in North, York, Elizabeth and Van Anden streets. The proposed sewer in North and York streets is to extend northerly in North street from Standard avenue to York street, a distance of some 866 feet, thence northwesterly in York street to Willey street, a distance of 261 feet, where it is to connect with the existing 10-inch sewer in York street tributary to the 4th, 5th, 6th and 7th wards' sewage disposal works. These works are located in the northwestern part of the city and the effluent from them is discharged into Troopsville Brook, a tributary to Owasco Outlet.

The sewer in North street is to be constructed of 8-inch vitrified tile pipe, laid on slopes varying from 1.4 to 2.5 per cent. The lower portion of this sewer is to be carried under the tracks of the N. Y. C. & H. R. R. R. by means of cast iron pipe. The sewer in York street is to be a 10-inch vitrified tile sewer throughout its entire length and is to have a slope of 5 per cent. Manholes are to be placed at all changes of slope and alignment on these sewers.

The records of the Department show that plans for sewerage and sewage disposal for the 4th, 5th, 6th and 7th wards' sewer district approved by this Department on May 15, 1905, showed an 8-inch sewer in these two streets having practically the same alignment as the proposed sewer. The spacing of the manholes and the slopes of the sewer, however, differed somewhat from those shown on the present plans. The present plans, therefore, constitute an amendment to the plans already approved in this respect and do not provide for any additional discharge of sewage not contemplated by the original plans.

The proposed sewer in Elizabeth street is to be an 8-inch sewer with a slope of 4.25 per cent. and is to extend from a point near Mary street to Steele street, a distance of 260 feet. This sewer is to connect with the existing sewer in Steele street which is tributary to the second ward sewer system and which system empties into the Owasco Outlet near Genesee street. According to the report of the City Engineer, submitted with the plans, the proposed sewer is to serve 9 houses and is to replace private drains in this section of the street which have become defective and inadequate.

The proposed sewer in Van Anden street is to extend from a point about half way between Cross street and State street to State street and is to take the place of old drains in this street. The proposed sewer is to be about 368 feet long and is to be constructed of 8-inch vitrified tile pipe laid with a slope of .75 per cent. It is to connect with the existing sewer in State street which discharges into the Owasco Outlet near the State street bridge.

From our careful examination of the plans it appears that the proposed sewers if properly constructed should be adequate as to size and capacity to care for the sanitary sewage of the sections to be served by them and that the construction of them will not increase the amount of sewage discharged into Owasco Outlet or its tributary over that already provided for inasmuch as the sewers in the streets to be served by them were either provided for by the original plans or they are to replace sewers already constructed. The conditions of sewerage and sewage disposal and the needs for the future disposal of the entire sanitary sewage of the city of Auburn were discussed in my report on the examination of plans for the sewers on Arlington avenue and other streets under date of September 10, 1914, and will therefore, not be reviewed at this time.

In view of the above I would recommend that the plans for the proposed sewers be approved and that permits be issued allowing the discharge of sewage to be collected by the proposed sewers into the Owasco Outlet and Troopsville brook. I would further recommend that the permit issued in connection with the approval of the plans for the proposed sewers in North and York streets contain the condition that the sewage to be collected by these sewers shall be passed through the sewage disposal plant for the 4th, 5th, 6th and 7th wards before its discharge into Troopsville brook. With respect to the proposed sewers in Elizabeth and Van Anden streets, I would recommend that the permit issued in connection with the approval of these plans contain in addition to the usual revocation and modification clauses the following condition:

> That whenever required by the State Commissioner of Health, satisfactory detailed plans for the interception and treatment of the entire sanitary sewage of the city or of any portion of such sewage not treated by the sewage disposal plant now in operation shall be prepared and submitted to this Department for approval; and that within the time limit stated in such requirement, any or all portions of such sewage disposal works shown by said plans as may be specified shall be constructed and put in operation.

ALBANY, N. Y., *September* 30, 1914

PERMIT

The permit issued in connection with the approval of these plans on October 2, 1914, contains the following conditions:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary.
2. That the issuance of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.

3. That only sanitary or domestic sewage and no storm water or surface water from streets, roofs or other areas shall be admitted to the proposed sewers.

4. That whenever required by the State Commissioner of Health satisfactory detailed plans for the interception and treatment of the entire sanitary sewage of the city or of any portion of such sewage not treated by the sewage disposal plants now in operation shall be prepared and submitted to this Department for approval; and that within the time limit stated in such requirement, any or all portions of such sewage disposal works shown by said plans as may be specified shall be constructed and put in operation.

BEDFORD HILLS (New York State Reformatory for Women)

Plans for alterations to the existing sewer system and the construction of a new sewage disposal plant consisting of an electrolytic plant, intermittent sand filters and sterilization plant were approved on May 14, 1914. The following communication was addressed to the State Architect on the same date:

Your letter of May 1, 1914, making application for the approval of additions and alterations to the existing sewer, and the construction of a new sewage disposal plant for the New York State Reformatory for Women at Bedford Hills, accompanied by drawings Nos. 2003, 2005, 2006 and 2007, has been received.

In considering this application, I desire to review briefly some of the facts connected with the history of the disposal of sewage at the reformatory.

This institution was opened on May 11, 1901, and the original system of sewage disposal consisted of septic tanks and subsurface irrigation. This disposal plant became inadequate on June 29, 1909, the State Architect applied to this Department for approval of a sewerage system and sewage disposal plant consisting of septic tanks, dosing apparatus and filter beds to care for a daily flow of about 25,000 gallons of sewage. At that time the census of the institution was 360, and the ultimate census — it was estimated — would not exceed 500. The per capita water consumption was approximately 50 gallons per day. Plans for this plant were approved by the Commissioner of Health on July 16, 1909. After installation it was apparently operated satisfactorily for several years until, with an increased census and also an increased per capita water consumption, the capacity of the plant became greatly overtaxed and the filter beds were found to be clogged a large portion of the time.

The per capita water consumption has steadily increased so that it is now approximately 150 gallons per day and, contrary to expectations, the average census of the institution has increased to over 560 during the year 1913 with a maximum census of 605.

Complaints of the plant and its operation were made during 1912 and 1913 by the New York city board of water supply and a temporary chlorinating apparatus for adding hypochlorite of lime to the effluent was installed early in 1913. Plans for a new sewage disposal plant were then prepared by your Department and were submitted for approval on the 21st of November, 1913.

The plan of sewage disposal then proposed consisted of Imhoff tanks, sand filters and a chlorinating plant. Although the system provided for in these plans was excellent in principle, the sand filter beds were, in the opinion of the Commissioner of Health, insufficient in extent and for this and other reasons of lesser importance they were not approved.

PRESENT CONDITIONS AT BEDFORD REFORMATORY

The following facts in relation to the conditions existing at the reformatory cannot be ignored in considering any new plan for the disposal of the sewage. The institution has developed far beyond what was originally contemplated. The per capita consumption of water has largely increased. The institution with its present maximum of 600 people is discharging its sewage through an overworked disposal plant into Broad brook, which empties directly into Croton lake. The distance to the Croton reservoir from the point at which the effluent enters Broad brook is 1.6 miles. The distance from the point where Broad brook enters the Croton reservoir to the point of intake of the New York city water supply is 10 miles. The total expenditure for the reformatory, under special appropriations, up to the present time has been $692,779.51. The cost of additional buildings now under contract for the institution will amount to $245,337.

Under these existing conditions you have applied to this Department for the approval of the plans for a new disposal plant. I quote from your applications as follows:

> ### *Existing Plant*
>
> Under the proposed scheme the existing sand filters, etc., are to be abandoned. The present chlorinating outfit which was installed by the institution, however, is to be removed and be reinstalled at location shown on block plan, so as to treat the final product when the sand filters are in operation.
>
> ### *Proposed Scheme*
>
> It is proposed to connect to the present trunk sewer leading to the present filtration beds and carry sewers to a new sewage disposal plant located where shown. Feeding into this line will also be the sewage from the new farm group, both groups being brought together as shown on plans and leading to a common screening chamber.
>
> You will note from the cross section that all sewage will flow by gravity directly to the receiving chambers, thence to the sand filters, also by gravity. From the screening chamber the sewage is brought together in one sewer leading to the first of a series of three settling chambers, the first chamber being designed for a roughing or receiving tank. The third chamber is used for settling the electrolyzed effluent; the second or middle chamber is a floating chamber, to be used in place of the first chamber or as an additional settling chamber in connection with the first chamber.
>
> From these tanks are led sewers to the electrolytic sewage disposal plant with sludge filter press.
>
> You will note that the electrolytic apparatus is to be installed in duplicate with two electrolyzers, each to be of capacity for total sewage, and two pumps. Leading from the third or second tank, the sewage can be discharged directly to the sand filters and thence to the chlorinating outfit, thence to the brook; or it is possible to deliver the contents of the third chamber directly to the brook. This will only be done at such times as the electrolytic apparatus is being used.
>
> ### *Operation*
>
> This apparatus being new to State work, is being installed as an experiment plant, so as to obtain the necessary data in connection with the same, as it can be easily seen that if the plant is a success a great deal of money can be saved in the future by its installation. As a precaution, however, as agreed, I am contemplating the installation of a complete outfit, together with the usual sand filters, etc.
>
> It is proposed to operate one of the apparatuses as long as there is no mechanical defect in the same, or no objections to the final product. If at any time this apparatus does not perform these functions, the second apparatus will be put in operation. If this does not prove satisfactory, then the sand filters will be put in operation.

The application and plans for the new disposal plant embody two distinct features: First, an experimental electrolytic sewage disposal plant; second, a complete system of sewage disposal combining the principles of sedimentation, sand filtration and chlorination. The experimental electrolytic plant is to be erected in duplicate and consists of two electrolyzers of new design and two pumps, each of which is sufficient to treat the entire quantity of sewage of the reformatory, and it also includes a filter press to filter and press the entire quantity of sludge obtained from the electrolyzers.

The plans also show that the experimental electrolytic plant may be readily by-passed and its settling chambers utilized as sedimentation tanks and the effluent therefrom allowed to flow on the sand filters; the effluent from these in turn receiving chlorine treatment. Although the principles of treatment in the electrolytic plant are new, it has not hitherto met with the success which had been anticipated for it, but it is hoped that the proposed experimental plant will operate satisfactorily. The second feature consists of a complete system of sewage disposal, comprising settling tanks, sand filter beds and chlorination apparatus. The methods involved in this system are well recognized and are everywhere regarded as entirely safe and suitable for such an institution.

The matter under present consideration, however, is of such great importance because this institution is situated upon the watershed of New York city, that it has seemed to me advisable to refer this question, with several others, to a special commission of experts. This commission consists of Dr. T. Mitchell Prudden, vice-president of the board of scientific directors of the Rockefeller Institute for Medical Research; Professor George C. Whipple, professor of sanitary engineering, Harvard University; Professor C.-E. A. Winslow, professor of biology of the College of the City of New York; Professor Henry N. Ogden, dean of the faculty of sanitary engineering, Cornell University, and Dr. William H. Park, director of the research laboratories, New York city department of health.

The members of this commission visited the reformatory and examined the present disposal plant and the conditions relating to the sewage disposal of this institution at this site. After full discussion they have fully approved of the principle of sedimentation, sand filtration and chlorination as applied to such sewage and have assured me that, if properly applied, the safety of the water supply from this watershed will be assured.

After most careful consideration, therefore, and after considering the advice of the commission referred to, I have approved of your application and plans subject to the following conditions:

1. That the installation and subsequent operation of the plant shall be at all times satisfactory to this Department.
2. That regular reports of the operation of the plant shall be submitted to this Department in such form and at such times as it may require.
3. That if at any time the operation of the electrolytic plant shall not prove satisfactory to this Department, it shall be abandoned, and the other portions of the plant at once modified and operated in accordance with the directions of this Department.
4. That the complete works shown by the plans, including the sand filters and chlorination plant, be constructed and the sand filter beds and chlorination plant shall be so maintained as to permit of putting them in operation at any time when required by this Department.
5. That at all times the sand filter bed shall have an area not less than a ratio of one acre to 600 population and that when the sand filters are in operation the effluent shall be disinfected by chlorination, using not less than five parts of available chlorine per million parts of sewage effluent and that the preliminary tank capacity shall be increased proportionately.

ALBANY, N. Y., *May* 14, 1914

On December 17, 1914, amended plans for a portion of the electrolytic disposal plant at this institution were approved. The report on the examination of the plans follows:

Amended plans for a portion of the electrolytic sewage disposal plant at the New York State Reformatory for Women at Bedford Hills, Westchester county, were submitted for approval by the State Architect on December 17, 1914.

The plans show a plan and section of the building containing the electrolytic plant. The settling tanks shown by the original plans of the building are not shown on the present plans. It is assumed, however, that no changes are proposed in the construction of the settling tanks nor in the sand filters and sterilization plant shown by the approved plans.

According to the letter from the State Architect transmitting the plans it appears that experiments which have been carried on by the manufacturers of the electrolytic machines since the original specifications were prepared have lead them to believe that the machines installed in a horizontal position is a better arrangement than if installed in a vertical position and that the proposed change necessitates enlarging the building. It is also stated that the contractor proposes to make these changes without additional expense to the State.

From our examination of the plans it is found that the building to contain the electrolytic apparatus is to be increased in size from 32′—4″ x 21′—8″ in plan to 40′—8″ x 26′—5″. The arrangement and equipment of the proposed building appears to be practically the same as originally planned with the following exceptions:

1. The electrolytic machines are to be placed in a horizontal position instead of in a vertical position.
2. A mixing tank is shown which was not shown by the original plans.
3. The location of the duplicate motor generators has been changed to a position a few feet from the electrolytic machines.
4. The air compressor shown by the original plans is not shown by the present plans.
5. A 3″ x 3″ line duct not shown by the original plans has been added.
6. A power board, presumably a switch, which was not shown by the original plans, has been added.

In view of the above and in consideration of the fact that plans for alterations and additions to the sewage disposal works at the New York State Reformatory, Bedford, embodying the use, as a part of the proposed method of sewage disposal of the so-called electrolytic method of sewage treatment, have heretofore on May 14, 1914, been approved by the State Commissioner of Health, it would seem that approval might appropriately be given to the plans for amendments as submitted since no substantial changes from the original design already approved are shown by such plans.

I would recommend, however, that the approval, if given, be conditional on compliance with the same conditions on which the original plans were approved.

ALBANY, N. Y., *December* 17, 1914

BETHLEHEM (Sewer District)

On November 23, 1914, plans for a combined sewer system for a sewer district in the town of Bethlehem were approved and a permit was issued to the Sewer Commissioners allowing the discharge of sewage from the two proposed sewers into the Hudson river through the sewer system of the city of Albany. The report on the examination of the plans and the conditions of the permit issued in connection with the approval of them are given below.

Plans for a system of combined sewers for a sewer district in the town of Bethlehem, Albany county, adjoining the city of Albany, were submitted by the Sewer Commissioners on October 6, 1914. A formal application for the approval of the plans was made on October 9, 1914.

The sewer district for which sewers are to be provided by the plans submitted to this Department comprises a portion of that part of the town of Bethlehem which adjoins the city of Albany on the southwest, lying south of Whitehall Road and northwest of Delaware avenue. The sewer district which is in reality a contiguous part of Albany has been largely built up by residences of the isolated type and building is active in this section at the present time.

The plans were prepared by Herschel Roberts, a civil engineer of Albany, and comprise tracings and blue prints of the following sheets:

1 Plan showing topography of region tributary to the sewer district and also details of sewer appurtenances.
2 General plan of sewer district showing sewers.
3 Profile of sewers.

The plans provide for a combined sewer system covering the entire sewer district. It appears from the report of the designing engineer that there is a considerable area outside of the present sewer district which is naturally tributary thereto and that the proposed sewer in Meriline avenue has been designed to ultimately care for sewage from the tributary area. Unless, however, the sewers in this tributary area outside of the sewer district are designed on the separate plan, the Meriline avenue sewer would probably not be of adequate capacity to care for this additional area.

The total area for which sewers are shown by the plans is approximately 27 acres and assuming a density of population of 15 per acre the total ultimate population will be 405. It is estimated from the topographical map of the region submitted by the designing engineer that the additional area which will be ultimately contributory to these sewers is approximately 200 acres giving a total contributory area of 227 acres and a total population of 3,405 on the above assumption as to density of population.

The sewers of the sewer district which are to vary in size from 12 inches to 24 inches in diameter are designed on the combined plan to receive both sanitary or house sewage and storm water and are to discharge into the sewers of the city of Albany through the existing 42 inch sewer in McCarty avenue at a point a short distance east of Delaware avenue. Plans for the interception and disposal of the dry weather flow of sewage of the city of Albany were approved by this Department on January 15, 1913, and these plans provided for the interception and treatment in the city sewage disposal plant of the sewage from the area tributary to the McCarty avenue sewer. Part of the present sewer district is shown on the general plan which was submitted at the time of the approval of the Albany plans, as contributory to the sewers of Albany.

With reference to the sizes, grades and capacities of this McCarty avenue sewer into which the proposed sewer district in the town of Bethlehem is proposed to discharge it appears from supplementing plans submitted and from information received from the city engineer of Albany that this sewer traverses McCarty avenue from Delaware avenue to Hoffman, thence to First avenue and thence to Benjamin street where its size is reduced from 4′-6″ in diameter to 3′-0″ in diameter, then continues down Benjamin street, Seymour street, Broad street, Bouck street to Island Creek. The lower portion in and below Benjamin street is obviously of less capacity than that above but I am advised by the city engineer that it is the purpose of the city when the capacity of the lower section of 3′- 0″ sewer is overtaxed to relieve this by extending the 4′- 6″ sewer down First avenue to the proposed intercepting sewer to be constructed in Pearl street, the sewage of which will be treated in the proposed sewage disposal works.

The proposed plans for the sewer district in the town of Bethlehem have been carefully examined with respect to the adequacy of the sewers to care for the sanitary sewage from the sewer district and the design has been carefully studied with reference to alignment, sizes, grades, capacities, facilities for cleaning and inspection and flushing and other features of a hydraulic and sanitary nature in connection with the proposed sewers but no attempt has been made to determine with any degree of accuracy the adequacy of the proposed sewers to care for the storm water of the district tributary to them after this district is fully developed. It is probable, however, that they are adequate as to sizes and capacities to care for both the storm water and sanitary sewage of the district for a considerable period in the future. Manholes are shown at every change of grade or alignment in the sewers and the sewers have been designed with slopes sufficiently steep to provide self-cleansing velocities in them under ordinary conditions.

through some 3400 feet of 14 inch cast iron pipe laid along the Pocantico river on a slope of about .16 per cent, to a new pumping station located near the bank of the Pocantico river about 350 feet from the existing disposal site and to construct intermittent sand filters and absorption fields to care for the entire sewage of the property.

The proposed pumping station is to consist of a circular reinforced concrete receiving well 15 feet deep above which is to be placed a frame building containing the pumping equipment. The elevation of the top of the pump well is to be 5 feet above the elevation of the Pocantico river as shown by the plans. No statement, however, is submitted as to the maximum high water elevation in the river so that it is impossible to determine if the pumping station would be flooded by high water conditions in the river.

It is proposed to install the two triplex pumps and motors used at the existing pumping station in the new plant. The plans also provide for the immediate installation of a centrifugal pump and the ultimate installation of an additional centrifugal pump in a dry well of the pumping station. These pumps are to be operated by 15 H. P. motors. It is proposed to install an auxiliary gasoline engine. The sewage from the centrifugal pumps is to be discharged to the proposed sand filters against a static head of about 20 feet through an 8-inch cast-iron force main and the triplex pumps are to discharge the sewage to the filters through a 6-inch main against the same head.

The proposed sand filters and the new absorption fields are to be located on the knoll referred to above, which is the site for the existing absorption field. The sewage from the pumping station will be discharged into a manhole at the upper end of the sand filters, from which it will flow by gravity through a 12-inch vitrified tile pipe to a hand-operated control chamber with four outlets provided with valves, one leading to each of the proposed filters. The control chamber is also to be provided with auxiliary overflow outlet pipes leading to the sand filters and with a 12-inch overflow discharging into a sand pit located at the foot of the bank adjacent to the knoll on which the filters are located. This overflow, which is 2 feet above the bottom of the control chamber, is 2¼ feet above the surface of the sand filter and only 6 inches above the invert of the 8-inch auxiliary outlet pipes leading to the sand filters.

Although the contours of the sand pit and of the ground between the sand pit and the river are not shown, it would appear from the elevations shown that the slope of the ground is from the sand pit toward the river. I am of the opinion, therefore, that it would not be safe to discharge the overflow from the sand filters into the sand pit from which partially treated sewage would be liable to reach the Pocantico river and that it would be better to connect the overflow with the proposed absorption fields if such overflow is considered necessary.

The sand filters are to be divided into 4 units having a combined area of about 1½ acres. Plans also show a reserved space for future sand filters about 1 acre in extent. The beds are to be filled to a depth of 2½ feet with sand below which is to be placed a 6-inch layer of fine gravel, ⅛" to ½" in size. Below the fine gravel is to be placed a layer varying in size from ½ to 1½ inches which is to cover the underground drains. The effective sizes of the sand to be used is not given.

The sand filters are to be surrounded with an earth embankment 3 feet wide at the top having side slopes of 1 vertical to 2 horizontal. The top of the embankment is to be 3 feet above the level of the sand in the beds. No details of the material of which the embankment is to be constructed nor the method of placing the embankment is indicated. It is important that this embankment, or at least the surface layers, should be made of a somewhat impervious material in order to prevent the sewage discharged onto the beds from seeping through the banks directly to the underdrains with little or no opportunity for purification, or elimination of the grosser solids before the sewage reaches the absorption field.

The sand filters are not to be provided with distributing systems. The sewage is simply to be discharged from the control chamber through an 8-inch pipe onto one corner of each bed, the beds being protected near the inlet with cobblestones. The underdrain system is to consist of 6-inch hexagonal agricultural tiles, laid with open joints and spaced 10 inches apart, and two main 10-inch underdrains which terminate in a manhole located near the central portion of the filter bed area. A manhole is to be placed at the upper end of each of these large drains. A 12-inch vitrified tile pipe is to extend from the junction manhole on the 10-inch pipes to an adjacent absorption field.

The absorption field is to be divided into 4 units having a total area of about 1½ acres. The distributing system of the absorption field consists of a concrete culvert located in the embankment between the two sets of units and 4-inch laterals spaced 10 feet apart extending from this feed culvert to open trenches 6 inches deep, 3 feet wide at the top and 10 inches wide at the bottom. These trenches are to have a slope of .16 per cent. Along the line of the concrete channel in the central area of the absorption field is to be placed a manhole provided with an adjustable right angled notched outlet weir so arranged that a fairly uniform distribution of the effluent to the different beds should be obtained. These absorption beds are not underdrained and have no outlet to the Pocantico river or its tributaries. The different units of the absorption fields are to be surrounded by embankments from 2 feet to 2½ feet high similar to those provided for the sand filters.

In conclusion I would state that it appears from the plans that the proposed sewage disposal plant has been designed in general to meet the local requirements for sewerage and sewage disposal for the property of the Briar Cliff Realty Company and should care for the present population of the property and permit of a reasonable increase in the future. There are, however, certain modifications in the plans as noted below which should be made before they should be finally accepted.

1. The elevation of the maximum high water level of the Pocantico river at the pumping station should be shown.
2. The capacity of the different pumping units should be given.
3. The effective size of the sand in the sand filters should be given.
4. The overflow from the control chamber of the sand filters should be omitted or connected with the proposed absorption fields.
5. The sand filters should be provided with more adequate distributing systems.

I therefore recommend that the plans be returned for modifications and additions in accordance with the above requirements.

ALBANY, N. Y., *October* 27, 1914

Revised plans for sewerage and sewage disposal for the Briarcliff Realty Company at Briarcliff Manor, Westchester county, were submitted to this Department for approval on November 13, 1914.

From our examination of the plans now submitted, it appears that they have been revised substantially in accordance with all of the above requirements. The elevation of the high water mark of the Pocantico river at the pumping station is shown to be only 1½ feet above the normal level of the river or about 2½ feet below the top of the walls of the pumping station so that the operation of the pumping station should not be interfered with by reason of high water conditions in the river. According to the report of the engineers, submitted with the plans, the proposed centrifugal pumps are to have a capacity of 500 gallons per minute each. The large triplex pump has a capacity of 95 gallons per minute and the small triplex pump has a capacity of 65 gallons per minute. It appears, therefore, that adequate provisions have been made by the plans to care for the probable maximum flow of sewage at the pumping station. The effective size of the sand at the sand filters is stated to be about .35 mm.

With reference to the overflow from the control chamber of the sand filters, the plans now show that an earthen dam 6 feet high is to be constructed across the low portion of the sand pit toward the river so that a basin having a capacity of over 500,000 gallons is provided and the report of the engineers states that the floor of this basin consists of a good quality of sand for natural filtration and absorption.

An additional plan has been submitted showing the distributing system to be provided for the sand filters. The distributing system of each filter is to consist of a main concrete channel 14 inches wide and from 7 to 10 inches deep with lateral channels 8½ inches wide by 4½ inches deep, composed of half flue linings. The lateral lines are 20 feet apart. It appears that this system should form adequate means for distributing the sewage over the area of the sand filters.

In conclusion I would state that it appears from our examination of plans that they have been revised in general accordance with recommendations of this Department and that the proposed sewage disposal plant, if properly constructed and if operated with care and efficiency, should satisfactorily care for the sewage of the Briarcliff Realty Company. I would therefore recommend that the plans be approved.

It is not necessary to issue a permit in connection with the approval of these plans inasmuch as no discharge of sewage or sewage effluent into any stream or other body of water is contemplated by them.

ALBANY, N. Y., *November* 18, 1914

BRIGHTON (Sewer District No. 1)

Plans for sewerage and sewage disposal for Sewer District No. 1 in the town of Brighton were first submitted for approval on April 18, 1913. After a careful examination of the plans they were returned for revision and were again submitted for approval on April 20, 1914. These plans were approved on April 29, 1914, and a permit was issued to the sewer commissioners of the sewer district allowing the discharge into a tributary of Allen creek of effluent from the proposed sewage disposal plant consisting of a screen chamber, pumping station, settling tanks of the Imhoff type, dosing chamber and intermittent sand filters. The report on the examination of the plans and the conditions of the permit issued in connection with the approval of them are given below.

Revised plans for sewerage and sewage disposal for Sewer District No. 1 in the town of Brighton, Monroe county, known as the Home Acres Tract, resubmitted to this Department for approval by the sewer commissioners thereof on March 25, 1914.

These plans, providing at that time for a sanitary sewer system and preliminary treatment works, were previously submitted for approval on July 18, 1913, and after an inspection of the disposal plant site and the stream into which the effluent was to be discharged was made by one of the engineers of the Department, the plans were given a preliminary examination and were returned to the designing engineer on August 18 with the suggestions that in view of the small size and nature of the stream into which it was planned to discharge the effluent from the proposed disposal plant it would be necessary to provide for supplementary or more complete treatment of the sewage, such as sand filtration, in addition to clarification in the proposed Imhoff tank. The engineer was also advised that the spacing of some of the manholes of the sewer system should be modified and that details of the pumping station should be submitted.

The plans now submitted were prepared by Wm. S. Lozier, C. E. Rochester, and comprise tracing and blueprints of each of the following sheets:

1. General plan showing proposed sewer system.
2. One sheet showing profiles of sewers.
3. One sheet showing general plan of disposal plant.
4. One sheet showing details of disposal plant.
5. One sheet showing plan and section of contact beds.
6. One sheet showing details of appurtenances.

Single copies of the report of the engineer and specifications covering the plans were also received.

The report of the designing engineer states that the sanitary sewers and the sewage disposal plant, with the exception of the contact beds, have been designed to care for the sewage that would be contributed from 388 houses based on an average of 5 persons per house and a per capita rate of sewage flow of 100 gallons per day. This would permit of subdividing each of the lots shown by the plans or of placing 2 houses on each of the ½ acre lots comprising the tract. With respect to the design of the contact beds the report states that it is based on a daily flow of 50 gallons per acre and a rate of operation of 600,000 gallons per acre per day for beds 4 feet deep on the ground that only sanitary sewage will be treated and that it will be some years before the sewer district will be entirely built up.

The sewer district known as Home Acres Tract is situated in the northwestern part of the town of Brighton adjoining the city of Rochester on the north. It covers an area of 120 acres and according to the report of the designing engineer will have an estimated future population of 1,940 persons, giving a density of population of about 16 persons per acre.

The plans for the proposed sewerage and sewage disposal systems have been carefully examined. In connection with the sewer system the design has been studied with reference to alignment, sizes, grades, capacities, facilities for cleaning and inspection and flushing and other features of a hydraulic or sanitary nature. In connection with the means for sewage disposal it has been studied with reference to the general method and efficiency of the sewage disposal plant as a whole and of the capacities and practical operation of the individual structures, appurtenances and apparatus.

The plans provide for both a sanitary and a storm water sewer system, but, inasmuch as the Public Health Law does not require the approval by this Department of plans for sewers used exclusively for storm water, consideration will be given in this report to the sanitary sewers only. These latter sewers which cover the entire area of the sewer district vary in size from 8 to 12 inches in diameter. Manholes are to be placed at all changes of slope and alignment and at intermediate points not more than 400 feet apart and automatic flush tanks are to be installed at the upper ends of the sewers in order to facilitate cleaning and inspection and flushing. The proposed sewers are to be laid with slopes sufficiently steep to prevent clogging and if properly constructed so as to prevent excessive infiltration of ground water they should be adequate as to sizes and capacities to satisfactorily care for the sewage contributed from the probable ultimate future population of the sewer district.

It is proposed to treat the sewage collected by this system in a sewage disposal plant located about 1,500 feet east of the sewer district on a small branch of Allen creek tributary to the Irondequoit river. The stream on which it is proposed to locate the plant has a drainage area above this point of some 2 square miles and an estimated dry weather flow of less than ¼ of a cubic foot per second.

The stream rises on the grounds of the Monroe County Alms House and the property of the State Hospital for the Insane near the intersection of South and Elmwood avenues about 1½ miles west of the Home Acres Tract and receives the storm water from the grounds and drives of these institutions as well as the overflow from a well on the property of the hospital.

Except for an occasional overflow from the sewage pumping station at the hospital no sewage is discharged into this stream and it was learned from the hospital authorities at the time of the inspection of the stream that steps were being taken to provide duplicate pumping equipments at the pumping station which should prevent any future overflow of sewage from this source.

Between the hospital and the disposal plant site the stream flows through farm lands and receives the drainage from a number of farms. Below this point it flows in an easterly direction for a distance of about 2,000 feet to a point where it flows into sink holes or crevices in the stream bed. Between this point and the disposal plant the stream flows in close proximity to several houses located at a place known as Twelve Corners and also through two farms where it is used for watering cattle.

Between the point where it disappears in the ground and the Erie canal, a distance of some 500 feet, there is no flow except during heavy freshets. Below the canal there appears to be at all times a considerable flow due probably to the seepage from the Erie canal.

The proposed sewage disposal plant, which is to consist of a pumping station, screen chamber, grit chamber, settling tank, 4 contact beds and auxiliary sludge drying bed for the disposal of sludge, is to be located above the stream on the property of E. M. Buckland about 300 feet south of Elmwood avenue. The nearest house is several hundred feet from the plant.

The sewage upon reaching the disposal plant is to be discharged into the open pump well 4 feet by 10 feet by 20½ feet deep inside dimensions. In front of the inlet sewer, which is to be 3½ feet above the bottom of the pump well, is to be placed a vertical bar screen with 1½ inch spacing in order to protect a 3 inch centrifugal pump to be located in the pump well. It appears that the arrangenemt and position of the screen is not such as to facilitate the cleaning of the screen and the removal of the screenings. The platform on which the motor driving the pump rests is 10 feet above the bottom of the pump well and 4 feet above the top of the vertical screen so that in addition to inconvenience in cleaning the screens some of the screenings would in all probability be raked over into pump chamber where they would be liable to produce a stoppage of the pump. A better arrangement would be to place the screen inclined at an angle of from 30 degrees to 45 degrees with the horizontal and to provide an operating platform placed level with the top of the screen to facilitate cleaning the screens and handling of the screenings.

The proposed pump is to have a rated capacity of 110 gallons per minute when operating against a head of about 15 feet and is to be driven by automatically operated motor of one horse power. In addition to this sewer equipment the specifications call for an additional pump which is presumably to be used only in the case of a break down of the other pump.

Inasmuch as all of the sewage of the entire tract is to be pumped a break down in the pumping equipment would affect almost the entire property and I believe therefore that duplicate pumping equipments should be installed and should be so arranged as to be automatically put into service at slightly different elevations of the sewage in the pump well. It appears also that the capacities of the proposed pump would not care for the ultimate maximum rate of flow that one of the pumps should have a capacity of not less than 150 gallons per minute.

It is also noted that the motor and operating platform is located about 8 feet below the outlet of the pump well so that in case of a break down the entire pumping equipment would be submerged where it would be almost inaccessible and very difficult to repair. I believe, therefore, that the pumps should be installed in a separate dry well adjacent to the pump well with the suctions extending through the wall into the pump well or that the motors and operating platform should be located above the maximum high water mark of the pump well.

It is proposed to pump the sewage into a short length of 12 inch iron pipe provided with a gate valve so arranged that the sewage may be passed either through a second screen chamber provided with an inclined bar screen and grit chamber before reaching the tank, or discharge directly into the settling tank through a 12 inch by-pass around the screen and grit chambers. In view of the fact that the sewage is to be screened in the pump well and since the sewers are sanitary sewers and will therefore receive no surface wash containing grit, sand or gravel there appears to be no advantage to be gained in passing the sewage through the second screen and grit chamber, especially since any grit or large floating material would probably be deposited in the pump well. I am of the opinion, therefore, that the money that would be spent for this portion of the plant could be used to better advantage in enlarging, re-arranging and properly equipping the proposed pumping station.

The proposed settling tank is to be a horizontal flow tank of the Imhoff type, 19 feet long by 17 feet wide at the top with a depth of about 28 feet.

It has two upper or settling compartments, and three lower sludge compartments with hopper shaped bottoms.

The two settling compartments will have a total capacity of about 14,000 gallons and will give an average detention period of 2½ hours when serving the population of 1,350 persons. The sludge compartment has a capacity of about 1,600 cubic feet and will provide storage for the sludge deposited from the sewage of about 1,700 persons for a period of about six months.

The sludge is to be removed from the tank through three 6 inch cast iron sludge pipes with bell mouthed ends extending to the apices of the sludge hoppers. These sludge pipes are connected with a 6 inch discharge pipe leading to the sludge bed by means of tees and one-quarter bend connections. The outlet of the discharge pipe is about 2½ feet below the flow line of the settling tank and is provided with 6-inch gate valve which when opened will discharge the sludge to the sludge bed by gravity due to the head of sewage above the outlet.

Although the note on the plans states that a one-inch perforated lead pressure pipe is to be placed in each compartment of the tank to facilitate the loosening of the sludge, the proposed arrangement of the sludge piping does not permit of inspecting or cleaning the individual sludge pipes in case of stoppage which is an important feature especially since only one valve is provided for the outlet of the three sludge pipes in place of one valve for each pipe as is the usual practice. Each pipe should extend to the top of the tank. This could be done by substituting cross fittings for the two tees on the pipes near the inlet end of the tank and the tee connection for the one-quarter bend of the other pipe. This would permit of inspecting and cleaning the sludge pipes in case of stoppage.

It is proposed to dispose of the sludge on sludge-drying bed having an area of 875 square feet. The filtering material of the bed is to consist of a bottom layer of gravel 8 inches thick and a top layer of sand 4 inches thick. The underdrain system is to consist of parallel lines of 3-inch tile spaced 4 feet apart which are to discharge into an 8-inch collecting drain tributary to the stream. The sludge bed is located about 180 feet from the settling tank and there is a difference of elevation of about 3 feet 7 inches between the flow line of the tank and the surface of the filtering material of the sludge bed, giving a hydraulic gradient of 2 per cent. It appears therefore that there is sufficient head available to properly convey the sludge from the tank to the bed.

It is planned to treat the clarified effluent from the settling tank in 4 contact beds which are to be filled to a depth of 4 feet with broken stone. These beds cover an area of about .083 acres. Based on a daily per capita rate of sewage contribution of 100 gallons and a rate of operation of 100,000 gallons per acre per day per foot of depth of filtering material, which is the usual basis of design, the proposed contact beds would care for a population of some 330 persons. The designing engineer states that he used a per capita rate of flow of 50 gallons per day and designed the beds to operate at the rate of 600,000 gallons per acre per day. It should be noted however that this rate of operation is excessive and that the organic content of the sewage to be treated is practically the same whether the actual flow is 50, 100 or 150 gallons per capita per day, and that in computing the rates of operation of filters to determine their adequacy a rate of flow of 100 gallons should be used in order to maintain a uniform standard of comparison.

With respect to the degree of purification provided for by the proposed disposal works it does not appear to be adequate to sufficiently protect the stream into which the effluent is to be discharged. The conditions here are different from those usually found in this State in that the stream is very small, flows in close proximity to several houses and through a number of back yards, is used at two farms for watering stock, and finally flows into a sink-hole about one-half mile below the disposal plant site.

I am of the opinion therefore that in order to prevent any objectionable conditions from arising in the stream below the plant a suitable effluent and one of a fairly high degree of purification should be provided for. Contact beds of adequate size and even when operating under favorable conditions will not always produce a suitable effluent. The effluent from such filters is by no means clear and sometimes contains considerable suspended matter. As suggested to the designing engineer under date of October 14, 1913, sand filters should be installed as a means of supplementary treatment. Such filters, if properly designed and constructed and operated, will always give a clear stable effluent.

In conclusion, I would state that it appears from our careful examination of the plans that the proposed sewer system, if properly constructed, should satisfactorily care for the sewage from the proposed sewer district, and that, with some modifications, as pointed out in the body of this report, the preliminary treatment works should be adequate to care for the population of about 1,500 persons, which population will probably not be exceeded for many years if no extensions are made to the district as shown by the plans. With respect to the supplementary treatment works or proposed contact beds, it appears that they are not only of inadequate size but that they would not provide for a proper efficiency nor give a satisfactory effluent nor one that might be safely discharged into the stream without objection at this time and that sand filters should be substituted for the proposed contact beds.

Such filters should be designed to care for a population of not less than 1,000 persons, inasmuch as the district will probably develop rapidly after the sewer system is installed. The sand filters should be divided into a number of units in order to give flexibility of operation and permit one or more units to rest while the remaining portions are in operation. They should have a depth of filtering material of not less than 3 feet composed of sand having an effective size of not less than .2 mm. nor more than .5 mm. and the beds should be designed to operate at a rate of not more than 100,000 gallons per acre per day on the basis of a daily flow of 100 gallons per capita. It will also be necessary to install a dosing tank provided with automatic dosing devices and with sufficient capacity to flood each unit of the filter to a depth of not less than one-half inch.

In view of the above, I would recommend that the plans be returned to the Designing Engineer for modifications or additions in the following respects:

1. The pumping plant should be rearranged and equipped in general accordance with the following suggestions:

(a) The inclined bar screen provided with an operating platform should be substituted for the vertical bar screen.

(b) Adequate pumping equipment, including both motors and pumps, one of which should have a capacity of not less than 150 gallons per minute, should be installed.

(c) The pumps should be located in a dry well or the motors and operating platform should be located above the high water mark in the pump well.

2. The screen and grit chambers between the pumping plant and the settling tank should be omitted.

3. The sludge piping should be so arranged that the ends of each sludge pipe will extend to the top of the tank.

4. Intermittent sand filters should be substituted for the proposed contact beds and should be designed in general accordance with the following suggestions:

(a) The filters should be divided into convenient units so arranged as to permit of throwing one or more units out of service when desired and allow them to rest.

(b) The filter should be designed to operate at the rate of not more than 100,000 gallons per acre per day on the basis of a daily per capi
rate of sewage contribution of 100 gallons.

(c) The filters should have a depth of not less than 3 feet o
having an effective size of not less than .2 mm. nor more than .

(d) The filters should be provided with adequate distrib
derdrain systems and the underdrains should preferabl

per day. The proposed rate of operation is about twice as high as filters of this type should be operated considering the depth of the filter and the small size of the plant. The capacity of the contact beds should be doubled and they should be divided into four units and provided with automatic dosing devices and timed discharge siphons.

The proposed sand filters which are to treat the effluent from the contact beds are to be located between the contact beds and the highway. Each of the two beds is planned with two 4-inch underdrains to be surrounded with gravel above which is to be placed a layer of sand 3 feet thick. The beds are to be surrounded with earth embankment. No statement is made as to the nature of the sand to be used for filtering material. The sand should be of as uniform size as practicable and should have an effective size of not less than 0.2 millimeters nor more than 0.5 millimeters.

The two beds shown by the plans have a total superficial area of .037 acres and would give a rate of operation of from 162,000 to 202,000 gallons per acre per day on the basis of design used. This rate is excessive and would in all probability produce a rapid clogging of the filters. It has been found that small disposal plants are rarely operated under constant, competent supervision and they must therefore, be designed to operate at lower rates than large plants and should be made as nearly automatic in their operation as practicable. I am of the opinion, in any case, that the area of the beds should be doubled and that these filters should also be divided into four units.

Owing to the close proximity of the proposed filters to the highway and adjacent dwelling the sand filters should be covered. The coverings of the roofs should be designed in sections so arranged that any or all sections of the roofs may be readily removed for cleaning and inspection of the filters.

In view of the fact that the stream into which it is proposed to discharge the effluent is dry at and for some distance below the disposal plant for a considerable portion of the year and since there are a number of houses located near the upper end of this stream, I do not believe that the effluent from the proposed disposal plant should be discharged into the stream without first sterilizing it. Under no consideration, however, should the sewage from the main building be diverted to the southerly slope of the property which is on the watershed of the Cornwall water supply.

In conclusion I would state that it appears from recent inspection of the sewerage conditions of the school and from our examination of the plans that the proposed modification and extension of sewage disposal works would not satisfactorily meet the local requirements for sewage disposal which in this instance are very exacting, and that the plans should be modified in the following respects before the final acceptance of them:

1. The present dosing tanks should either be omitted or it should be modified and provided with four plural alternating siphons to be operated in connection with the contact beds.
2. The area of the proposed contact beds should be increased to not less than 800 square feet and this area should be divided into four units to be operated either by plural alternate siphons or by sewage feeds of the Adams type in connection with timed discharge siphons.
3. The area of the sand filters should be increased to not less than 3,200 square feet and should be divided into four units. The filters should be covered or roofed over in such a way as to make them readily accessible for cleaning and inspection.
4. The filtering material above the underdrain systems should be composed of clean sand having an effective size of from 0.2 to 0.5 millimeters.
5. A chlorination plant to treat the effluent from the sand filters should be provided.

I would, therefore, recommend that the plans be not approved and that they be returned for modification in accordance with above requirement.

ALBANY, N. Y., *July* 30, 1914

Plans for sewage disposal for the Stone School revised in accordance with the above requirements were submitted to this Department for approval on August 19, 1914.

It appears that the existing settling tank is to be built as shown on the plans first submitted and operated in series. As pointed out in my former report on the examination of these plans it will give from 28 to 34 hours detention of the sewage on the basis of design used and as this detention is longer than necessary or desirable, I am of the opinion that it may be found necessary to so modify the tank that only one of the existing compartments of the settling tank may be used at a time.

According to the report of the designing engineer, it is proposed to omit the contact beds shown by the plans as first submitted on the grounds that the very low flow which would occur at a school of this kind during the night would interfere with the proper operation of the automatic dosing devices. The present plans, however, provide for increasing the area of the sand filters to about 3,300 square feet. These filters are to be divided into three units 55 feet by 20 feet in plan each. Each unit is to be filled to a depth of 3 feet with sand. The filters are to be provided with 4-inch underdrains laid in depressions about 5 inches deep. The drains are to be surrounded with coarse gravel and the joints are to be protected with tar paper. The filters which will have a total area of about 0.076 acres will be required to operate at a rate of from 75,000 gallons to 99,000 gallons per acre per day on the basis of design used, namely a present population of 60 and a future population of 75, assuming a rate of sewage contributing 100 gallons per capita per day.

The plans also provide for the sterilization of the effluent from the sand filters. A small building with the liquid chlorine apparatus is shown over the trap on the effluent pipe from the sand filter. According to the report of the designing engineer the liquid chlorine gas is to be diffused through a carborundum sponge.

Permission is asked by Mr. Stone of the Stone School to temporarily omit the construction of the sterilization plant until such time as it is deemed necessary by this Department. Inasmuch as the proposed sewage disposal plant if properly constructed and operated with care and efficiency should prevent the creation of a nuisance and since no water supply is derived from the stream receiving the effluent below the plant and since the school is closed during the summer when the flow in the stream is at a minimum, I am of the opinion that the sterilization plant could well be omitted at this time without creating any objectionable conditions in the stream below.

In view of the above, I would recommend that the plans be approved and a permit be issued allowing the discharge of effluent from the proposed sand filters into the small stream which rises on the school property and flows northerly discharging into the Hudson river at Cornwall Landing and that the permit contain in addition to the usual revocation and modification clauses the condition that whenever required by the Commissioner of Health the sterilization plant shown on the plans shall be constructed and put in operation.

ALBANY, N. Y., *August* 31, 1914

PERMIT

The permit issued in connection with the approval of these plans on September 2, 1914, contains the following conditions:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner Health such revocation, modification or change shall become necessary.
2. That the issuance of this permit shall not be deemed to affect in way action by this Department on any future application that [illegible] made for permission to discharge additional sewage or effluent [illegible] waters of this State.

These plans show that the village limits have been extended since the original plans were approved and that it is now proposed to construct sewers tributary to the existing system in the developed portions of the new area west of Locust avenue and in what is known as the Martin Tract and the Allen Park districts. They also provide for the reconstruction of the sewer in Beach street, between Locust street and Broadway by lowering and enlarging this sewer so as to permit of draining the area west of Locust street. The existing sewer in this part of Broadway is 8 and 10 inches in diameter. It is now proposed to enlarge it and to construct it of 10, 12 and 15 inch pipe.

In the Martin Tract and the section west of Locust street situated in the northwestern part of the village, sewers are to be constructed in Wilder Terrace, Lake, First, Second, Third and Beach avenues and in Locust and Second streets. In the Allen Park tract situated in the southwestern part of the village, sewers are to be constructed in Stutson street, Allen Park, Pollard avenue and Wilder street. No streets are shown in the areas between these developments.

All of the proposed sewers are to be 8 inches in diameter and with one exception are, for the most part, to be constructed with fairly steep slopes. The exception referred to is the sewer in the upper end of Beach street, between Pine and Locust streets which is planned with a slope of only .25 per cent. Although this sewer is only about 600 feet long and is to have a flush tank at its upper end and two intermediate manholes which should provide good facilities for cleaning and flushing, I am of the opinion that either the size of the sewer should be increased from 8 to 10 inches or its slope increased to not less than .3 per cent. and preferably to not less than .35 per cent. in order to provide self-cleansing velocities and prevent frequent clogging of this sewer.

Except for the sewer in Locust street manholes are to be installed at all changes of slope and alignment of the proposed sewer. The sewer in Locust street is planned with a change of slope about midway between Ontario and Hickory streets. A manhole should be installed at this point in order to facilitate cleaning and inspection.

From our careful examination of the plans it appears that the proposed sewers if modified in accordance with the above suggestions should satisfactorily care for the sanitary sewage of the areas to be served by them. No statement is made, however, as to the question of future treatment of the sewage of the village.

The original system provided for the discharge of untreated sewage into the Genesee river at three points. It appears that no requirements for the treatment of the sewage were made by the State Board of Health when these plans were approved on the grounds that "the city of Rochester discharged large quantities of raw sewage into the Genesee river five miles above the village and that no danger to health was likely to result from the addition of the small amount of sewage collected by that village". The city of Rochester, however, has since taken steps to remove its sewage from the river by constructing intercepting and outfall sewers by means of which the entire dry weather flow of sewage of the city is to be intercepted and conveyed to the proposed sewage disposal plant located near the lake front some two miles east of the mouth of the Genesee river, after treatment in which the effluent is to be discharged into Lake Ontario at a point 7,000 feet from shore in 60 feet of water.

This action on the part of the city will not only remove the gross pollution that now enters the Genesee river but it will also improve the quality of the water supply furnished by the Rochester and Lake Ontario Water Company which is derived from the lake at a point about 1½ miles west of the mouth of the river. The sewage from the Summerville and Windsor Beach districts situated across the river from Charlotte is now being treated in a sewage disposal plant consisting of settling tanks and sprinkling filter, before its discharge into the river, and sewer district No. 2 of the town of Greece is required, under the provisions of the permit recently granted to the sewer commissioners thereof, to treat its sewage if within a reasonable time it is not cared for by the city of Rochester.

I am of the opinion that in view of the attitude of the Department with reference to a curtailment of the pollution of the Genesee river and especially in view of the action taken by the municipalities on the lower Genesee river in providing for sewage disposal as required by the Department and in order to still further improve the condition of the river and lake and protect the public water supply derived from the lake, the village of Charlotte should also be required to provide for the interception and treatment of its sewage before discharge into the river. Such treatment of the sewage should embody organic purification such as would be obtained by passing clarified effluent through either coarse grained or fine grained filters. It would seem reasonable, however, to temporarily allow the discharge of sewage from the proposed sewers into the Genesee river until such time as the Rochester sewage disposal works shall have been constructed and put into operation as was done in the case of sewer district No. 2 in the town of Greece.

I would therefore recommend that the plans for the proposed sewer extension be approved and that a permit be issued allowing the discharge into the Genesee river of sewage from the proposed sewers on the following conditions:

1. That either the size or the slope of the 8-inch sewer in Beach street be increased.
2. That an intermediate manhole be installed at the point of change of slope of the Locust street sewer.
3. That on or before February 1, 1915, detailed plans satisfactory to this Department for intercepting sewers and complete sewage disposal works for the treatment of the entire sanitary sewage of the village be submitted for approval and that such intercepting sewers and sewage disposal works shall be constructed and put in operation whenever required by the State Commissioner of Health.

ALBANY, N. Y., *January* 31, 1914

PERMIT

The permit issued in connection with the approval of these plans on **February 5, 1914**, contains the following conditions:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary.
2. That the issuance of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.
3. That only sanitary or domestic sewage, and no storm water or surface water from streets, roofs or other areas shall be admitted to the proposed sewers.
4. That the diameter of the proposed sewer in Maple street, shall be increased to 10 inches or the gradient of this sewer when constructed shall be not less than 0.3 per cent.
5. That an intermediate manhole shall be installed at the point of change of slope of the proposed sewer in Locust street.
6. That on or before February 1, 1915, detailed plans satisfactory to this Department for intercepting and outfall sewers to convey the entire sanitary sewage of the village of Charlotte to a suitable site for sewage disposal works, together with detailed plans for complete sewage disposal works to treat the entire sanitary sewage of the village shall be submitted to this Department for approval; and that after approval of said plans any or all portions of the intercepting and outfall sewers and of the sewage disposal works shall thereafter be constructed and put in operation whenever required by the State Commissioner of Health.

CORNWALL-ON-HUDSON (The Stone School)

Plans for a sewage disposal plant for the Stone School were submitted for approval on July 11, 1914 and after an examination of the plans and following an inspection of the school by a representative of the Department, the plans were returned for modifications. Plans revised in accordance with the requirements of this Department and providing for a sewage disposal plant consisting of a settling tank, dosing chamber, intermittent sand filters and sterilization plant were resubmitted for approval on August 19 and were approved September 2, 1914. The reports on the examination of the plans and the conditions of the permit issued are given below.

An inspection of the sewerage conditions of this school was made at your direction by Mr. C. A. Holmquist, assistant engineer of this Department on July 29, 1914. It appears from this inspection and from the report of the designing engineers, Waring, Chapman and Farquhar of New York city, who prepared the plans that the school of which Carlos H. Stone and Alvan E. Duerr are headmasters is located about 1¾ miles south of Cornwall Landing on a ridge running in a general easterly and westerly direction at an elevation of about 800 feet above sea level. The ground slopes quite abruptly both north and south from the central portion of the school property.

The northerly slope is drained by a small intermittent stream which rises on the property and flows in a general northerly direction to the Hudson river discharging into the river at Cornwall Landing about two miles from the school. The southerly portions slope rather abruptly towards a small stream which discharges into one of the distributing reservoirs of the Cornwall water supply. The reservoir is about one-half mile below the school.

Until about five years ago nearly all of the sewage from the school was cared for in a sewage disposal plant consisting of a settling tank and subsurface irrigation system on the southerly slope of the property about 600 feet from the stream tributary to the Cornwall water supply. This system which contains from 3,000 to 4,000 feet of tile and covers an area of about one acre was found to be inadequate for the needs of the school, endangering the Cornwall water supply and the major portion of the sewage or that from the main building was consequently diverted to the northerly slope of the property where it is now cared for in a disposal plant comprising a settling tank, dosing chamber and covered sand and general filter enclosed with concrete sides. The old plant still cares for the sewage from the farmer's cottage, the gymnasium and a portion of the cottage. The sewage from two toilets, one shower bath, one bath tub and one washhouse used by about twenty boys in the cottage is discharged into an old abandoned well which does not appear to have given rise to trouble from filling up or overflowing.

The disposal plant constructed about five years ago receives the sewage from the main building. Practically all the cooking, dishwashing and laundry work is done in this building which is also used as dormitory. The population served by this plant is estimated at sixty persons and the water consumption according to meter readings is 66 gallons per capita per day.

The settling tank of the plant is located about 150 feet north of the main building and about 100 feet of the highway leading to Cornwall, and the sand and gravel filter is situated about 200 feet northeast of the tank and about 50 feet from the same highway. The effluent from the filter discharges into the upper end of a pipe culvert which passes under the highway about 75 feet from the plant. This culvert also received the flow from the intermittent stream referred to above. There was no flow in the stream at the outlet from the disposal plant nor was there any flow from the effluent pipe as the school is closed for the summer. Water appeared in the stream about 200 feet below the disposal plant. Below the disposal plant the stream flows at a distance of from 150 to about 300 feet from three residences whose property lines extend to or beyond the stream, about one-quarter of a mile down stream it crosses another highway where it passes near one or two more buildings. There are no houses near the stream for a distance of about one mile below that point.

It was learned that there has been considerable complaint from property owners below the stream due to the discharge of sewage from the disposal plant and that there is serious objection to discharging any effluent whatsoever into the stream. The owner of the property nearest to the disposal plant stated that he would not take the responsibility of renting his house to any one with children owing to the possible danger of infection to children playing in the brook.

The present sand and gravel filter is 20'x20'x5' deep. According to the report of Waring, Chapman and Farquhar the filter is composed of graded material varying in size from cobble stones to fine pebbles overlaid only a few inches of sand, which has been reduced in thickness to from one to two inches. Although the school was closed for the summer sewage was standing on the surface of the filter. There was no flow, however, at the time of the inspection, from the outlet which would indicate that the bed was completely clogged. At best it would act only as a strainer with little or no bacterial efficiency.

The plans now before the Department and under consideration show that it is proposed to modify the present settling tank and dosing chamber, to convert the sand and gravel filter into contact beds and to construct two new intermittent sand filters. The existing settling tank is 8'x12'x4' deep below the flow line giving a detention of the sewage of 14 to 17 hours, when serving from sixty to seventy-five people contributing sewage at the rate of 66 gallons per day.

The dosing tank located adjacent to the settling tank is of the same size as the settling tank. The dosing siphon is to be removed from this chamber which will act as a second settling tank having a capacity equal to that of the settling tank. The combined settling capacity will provide a detention of from 28 to 34 hours. This detention is longer than necessary or desirable inasmuch as such long storage is liable to and generally does create objectionable odors and makes the sewage more difficult to treat in supplementary treatment works than fresher sewage. I am of the opinion, therefore, that the arrangement should be made to operate only one of these tanks.

The sludge from the settling tank is to be cared for on an open sludge bed 8'x27' in plans. This bed is to be excavated in natural soil and surrounded with earth embankment. An underdrain laid longitudinally through the bed and discharging on the surface of the ground near the bed is to be provided. The sludge pipe is to be covered with graded gravel, over which is to be laid a 6-inch bed of sand.

From the settling tank the effluent is to be discharged through the existing 4-inch sewer to the gate chamber at the sand filter located about 240 feet from the settling tank. The by-pass at the gate chamber is to be removed.

This sand filter is to be converted into two contact beds. A 6-inch concrete wall is to be constructed through the middle of the filter and a line of 8-inch split tile is to be laid on the floor of each unit. The upper end of each of the underdrains is to connect with a feed pipe from the gate chamber so that the beds will be operated on the upward fill plan. It appears that either one or both of the beds may be operated at a time. The filter is to be filled to a depth of 4.5 feet with filtering material consisting of a lower layer of selected cobbles and broken stone and a top bed of 2-inch gravel or broken stone.

Each of the beds is to be connected with a dosing chamber provided with a 4-inch discharge siphon having a drawing depth of 4 feet 3 inches
the sewage will not be exposed on the surface of the filter.
are planned to discharge into an adjacent gate chamber
sewage may be diverted to either or both of the proposed
combined areas of the two beds is about .009 acres and
daily per capita rate of sewage contribution of 100
tion of the contact beds would be from 670,000 to

the area between Broadway and the southerly corporation line. The proposed sewers comprising this system are to consist of a 20-inch trunk sewer and 8-inch lateral sewers. The trunk sewer is to be laid on a slope of 0.12 per cent. and will extend from the existing sewage disposal plant site easterly along an abandoned raceway and through private property and in existing streets to Penora street, a distance of nearly 6,000 feet.

This sewer crosses Cayuga creek which flows through this section at three points by means of double tubed inverted siphons. At the two lower creek crossings it is planned to use 15-inch cast-iron pipe and at the upper crossing 12-inch cast-iron pipe for the siphons. Although it is proposed to flush this sewer by admitting creek water at Penora street until the contribution of sanitary sewage from this section of the village is sufficiently large to give self-cleansing velocities in the trunk sewer, I am of the opinion that the proposed siphons are too large to give scouring velocities through them for a considerable period in the future even with one pipe in operation and that better results would be obtained and adequate capacities of the siphons provided for if the two lower siphons be constructed of one 12-inch line and one 15-inch line, and the upper siphon of one 10-inch line and one 12-inch line so arranged that either or both lines may be used at one time.

Some 2,000 ft. of the lower portion of the sewer is to be constructed along an abandoned raceway and through private property near Cayuga creek. The elevation of the ground along a portion of this line is only slightly above the invert of the proposed sewer and although the manholes on this section are shown extending to an elevation of about 4½ feet above the crown of the sewer which would indicate that it is proposed ultimately to grade the ground to that elevation it is not so shown on the plans. It is essential that sufficient embankment should be provided to adequately protect the pipe.

As noted above the lateral sewers which are comparatively short are all to be eight inches in diameter and are to be constructed with slopes of not less than .35 per cent. Manholes are to be constructed at the upper ends of all sewers, at all points of change of slope and alignment and at intermediate points on straight alignments not more than 300 feet apart.

From our careful examination of the plans it is found that the proposed sewer system if properly constructed and if modified in accordance with the above suggestions should satisfactorily care for the sanitary sewage of the area shown by the plans both for the present and for a reasonable period in the future. It appears also that the trunk sewer is designed with sufficient capacity to care for the probable future population of a limited section situated south of the village should such area be annexed to the village at some future time.

As already noted it is planned to convey the sewage from the proposed sewers to the existing sewage disposal site near Borden road where the sewage of the village is treated. This plant which consists of septic tanks, contact beds and wave beds was designed to care for a population of about 2,500 persons and as the present population of the village is about 4,500 it is evident that this plant must be seriously overtaxed and that no more sewage should be made tributary to it unless the plant is enlarged or modified in accordance with plans approved by this Department. In this connection it may be stated that plans for a new sewage disposal plant consisting of a settling tank and sprinkling filter to be located at the old disposal site have been presented by the designing engineer of the plans now under consideration. The plans, however, have not been formally submitted by the village authorities.

In view of the above I would recommend that the plans for the proposed sewer system in the southern portion of the village of Depew be approved on the conditions that before any of the proposed sewers are constructed, plans satisfactory to this Department, for an enlargement or a modification of the present sewage disposal plant, or plans for a new disposal plant be submitted by the village for approval and that before any of the proposed sewers are put in operation or used such modified, enlarged, or new sewage disposal plant shall have been constructed and put in operation.

ALBANY, N. Y. *January* 7, 1914

PERMIT

The permit issued in connection with the approval of these plans on January 10, 1914, contains the following conditions:

> 1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary.
>
> 2. That the issuance of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.
>
> 3. That only sanitary or domestic sewage and no storm water or surface water from streets, roofs or other areas shall be admitted to the proposed sewers.
>
> 4. That the two inverted siphons under Cayuga creek, one at South Ellington street and one at Elmwood avenue, shall each be constructed with one 15-inch cast-iron pipe and one 12-inch cast-iron pipe, and the inverted siphon at Penora street shall be constructed with one 12-inch cast-iron pipe and one 10-inch cast-iron pipe.
>
> 5. That before any of the proposed sewers are constructed satisfactory detailed plans for an enlargement or a modification of the existing sewage disposal plant or for a new disposal plant shall be submitted by the village authorities for approval; and that no sewage shall be discharged into any of the proposed sewers until such enlarged or new sewage disposal plant is constructed and put in operation under plans approved by the State Commissioner of Health.

Plans for a new sewage disposal plant for the village of Depew, Erie county, were submitted to this Department for approval on December 3, 1913. A formal application for the approval of the plans signed by the president of the village and the village clerk was received on April 22, 1914.

The records of the Department show that original plans for sewer system and sewage disposal plant for the village of Depew were approved by the then State Board of Health on June 30, 1896. Plans for changes and modifications to these plans and for extensions of the original sewer system have been approved from time to time since 1896. On January 10, 1914, plans for a system of sanitary sewers covering a comparatively large area under development in the southern part of the village tributary to the existing sewer system and sewage disposal plant were approved on the following condition:

> That before any of the proposed sewers are constructed satisfactory detailed plans for an enlargement or a modification of the existing sewage disposal plant or for a new sewage disposal plant shall be submitted by the village authorities for approval; and that no sewage shall be discharged into any of the proposed sewers until such enlargement or new sewage disposal plant is constructed and put in operation under plans approved by the State Commissioner of Health.

This provision was deemed necessary, inasmuch as the present sewage disposal plant is considerably overtaxed.

The plans now under consideration, which were submitted in accordance with the above requirements, were prepared by George C. Diehl, C. E., Buffalo, N. Y., and comprise tracings and blueprint duplicates of the following:

1. General plans of proposed sewage disposal works.
2. Plans showing pumping station.
3. Plans showing sprinkling filter.
4. Plan and details of settling tank.
5. Plan and details of dosing tank.

The report of the designing engineer on the design of the sewage disposal plant and a set of specifications covering the proposed works were also received.

The report of the engineer states that the proposed sewage disposal plant is to be located upon the site of the old plant, which is out of date. The report also states that fluctuations in the flow of sewage in the sewer system at times of wet and dry weather indicate considerable infiltration of ground water and possibly the connection of rain water leaders with the sewer system. If there are found to be roof water leaders contributing storm water to the sanitary sewer system, such leaders should be required to be disconnected from the house sewers as soon as practicable.

The population of the village, according to the 1910 United States census, was about 4,000, and shows an increase of 640 since 1900. The present population however is estimated by the engineer at 4,500, but it is stated in his report that such a large number of persons, living elsewhere, work in Depew and are therefore contributing sewage to the sewers that he believes a population of 6,000 more closely approximates the number of persons contributing sewage to the sewer system and disposal works. The report also states that the disposal plant to be constructed at the first installation has been designed to care for a population of 10,000 persons and general provisions are made by the plans for the construction of two more similar plants so that an ultimate population of 30,000 persons is provided for.

No data are submitted regarding the population which is now or will be in the near future contributing sewage to the disposal works which would seem to justify the expense of providing sewage treatment works of a capacity to serve more than 6,000 persons and at least not 10,000.

The village of Depew is located near the central part of Erie county on Cayuga creek, a tributary of Buffalo creek. It is provided with an unfiltered water supply taken from Lake Erie and the works are controlled by the Western New York Water Company. The village is also provided with a public sewer system serving practically the entire population. The sewage is at present treated in the sewage disposal plant, consisting of a settling tank, contact beds and wave beds. The plant was designed to care for a population of about 2,500 persons, and as the present permanent population is about 4,500, it is evident that the plant is seriously overtaxed.

The proposed sewage disposal plant is to consist of a settling tank, sprinkling filter and a temporary sludge bed is to be located on the site of the present plant in the southwestern part of the village close to the north bank of Cayuga creek. This stream has a drainage area above this point of approximately 110 square miles. There is a fairly large rural and urban population on the watershed. The stream is not used for water supply purposes below the proposed disposal plant.

Assuming a minimum run-off of 0.10 cubic feet per second per square mile of drainage area, a discharge of 11 cubic feet per second is obtained for Cayuga creek at Depew. For a population of 6,000 a flow of about 1.8 cubic feet per second per thousand persons contributing sewage is obtained. This dilution would be too small to prevent the creation of a local nuisance under ordinary conditions if the sewage of the village were discharged into it without treatment even though the stream received no pollution above Depew.

Upon reaching the disposal plant the sewage is to be passed through a $\frac{7}{8}$-inch bar screen. This is assumed to mean that the bars of the screen are to be spaced $\frac{7}{8}$ of an inch apart in the clear, although no other dimensions are given on the plans nor in the report of the engineer. I am of the opinion that the open spacing between adjacent bars of screens should be not less than one inch and that closer spacings usually tend to produce rapid clogging and increases the cost of operation. I would recommend therefore that spacin of the bars of the proposed screen be increased to not less than one inch.

After passing through the screen chamber the sewage is to flow by gra through a 24-inch vitrified tile pipe into the inlet chamber of the settl of the Imhoff tank. This tank, which is designed to have a concr has a diameter of 40 feet and a maximum depth of 44 feet, inside with a depth of 39 feet from the flow line to the bottom of the sludge compartment.

The tank is divided by means of 7/16-inch iron plates into two upper concentric settling compartments and a lower or sludge compartment for the storage and digestion of sludge. It is planned to have the sewage enter the outer concentric settling chamber over a weir in the side of the inlet chamber and flow through the outer chamber into and through the inner concentric chamber from which it is to flow over a weir into the outlet chamber. It is doubtful however that the flow of sewage in the tank will be in complete conformity with that indicated by the plans, and it is probable that a portion at least of the sewage will tend to flow directly from the outer compartment through the slot to the inner compartment.

The settling compartments of the tank have a total capacity of about 106,000 gallons, which would provide for a period of detention of about 4.2 hours for the present estimated population of 6,000 and about 2½ hours' detention for a population of 10,000, assuming a per capita rate of sewage contribution of 100 gallons per day. The velocity of flow through the settling compartment will vary from .008 to .017 feet per second on the basis of design used.

The sludge compartment has a capacity of about 17,000 cubic feet which would care for a population of about 18,000 persons. It is to be provided with a sludge pipe which extends from a point near the apex of the compartment to a point about 2 feet outside the wall of the settling tank where it terminates in a valve. The slope of the bottom of the chamber is one vertical to 2½ horizontal.

The gas vents for the sludge compartment consist of a central shaft 6′ in diameter at the top and twelve 12″ x 24″ rectangular shafts extending from the outer periphery of the tank to the angle between the wall of the tank and the partition between the outer settling compartment and the sludge compartment. The total area of the gas vents is 1/25 of the area of the sludge compartment.

It is unquestionable that the storage period provided for in the sludge compartment is longer than necessary for tanks of this type and could be reduced considerably by decreasing the depth of the tank without reducing its efficiency. Experience with tanks of this type does not indicate that there is any advantage in having a greater depth from the flow line to the bottom of the sludge hopper than 30 feet. There would be a considerable saving in the cost of construction if the proposed depth of 39 feet were reduced inasmuch as it appears from the plans that from one-half to three-quarters of the excavation for the construction of the tank will be in rock.

The slope of the bottom of the sludge compartment is also too flat to insure a free flow of sludge to the sludge pipe during cleaning especially in view of the large diameter of the tank. The slope of the bottom of the sludge compartment of the Imhoff tank should not be less than one vertical to two horizontal and even with this steeper slope it might be advisable to install a perforated water pipe in the sludge compartment to assist in the loosening of the sludge during emptying. The sludge pipe should also be continued in a straight line to the top of the ground and should have the valve controlling the discharge through the pipe so placed as to permit of cleaning the sludge pipe. The combined area of the gas vents for the sludge compartment is too small and should be materially increased.

From the settling tank the sewage is to flow through an 18-inch cast iron pipe into a pump well at the pumping station. A rectangular emergency overflow from the pump well is provided by the plans. This overflow is shown placed at an elevation of about two feet above the invert of the inlet to the pump well. It should not be necessary to provide an overflow at the pumping station inasmuch as a failure of the supply of electric current could be provided for by the installation of an auxiliary pump and electric generator to supply current in cases of emergency, or it would be possible to install an independent engine and pump to pump the sewage in case of a break down in the proposed equipment. Such auxiliary power and pumping equipment should be installed to insure continuous operation of the plant.

The capacity of the pump well below the invert of the inlet is equal to a flow of about 33 minutes for present conditions. A triplex plunger pump of the Deming or similar type having a capacity of 1,500 gallons per minute equal to 2,160,000 gallons per day is to be installed in the pumping station. The pump, it is stated, is to be driven by a direct connected 15 H.P. electric motor and is to operate against a static head of from 16 to 22 feet.

From the pump well the sewage is to be pumped through 10-inch force main into a dosing tank having a capacity below the maximum elevation of the sewage indicated by the plans of about 7,500 gallons. It is to be provided with a discharge siphon of the Miller type the size of which is not shown. For flows of 600,000 and 1,000,000 gallons per day this siphon would discharge into the distributing system of the sprinkling filter at intervals of about 14 minutes and 8½ minutes respectively.

The dosing tank is planned with vertical sides. It is usual to construct dosing tanks to be operated in connection with sprinkling filters with sloping sides and I am of the opinion that a more uniform distribution of the sewage over the surface of the filter and consequently better results would be obtained if the proposed tank be constructed with one or more sloping sides.

The sprinkling filter which is 170 feet by 190 feet in plan, equal to about .74 acres in area, is to be constructed with concrete walls and floors. It is to be filled to a minimum depth of 5 feet with filtering material ranging in size from 2½ to 1½ inches. On the bottom of the filter below the filtering material is to be placed a layer of large stones, laid by hand to form a portion of the underdrain system. The floor of the filter is to slope towards 8-inch lateral drains spaced about 40 feet apart. These drains are to discharge into a main 24-inch collecting drain located in the operating gallery of the sprinkling filter from which an outlet pipe will be continued to a point near the top of the bank of the stream.

The distributing system is to consist of 20-inch cast iron main distributor, 10-inch laterals and 3-inch riser pipes with nozzles of the Columbus type or equal spaced 15 feet apart. The sewage is to be applied to the filter intermittently at a rate of from 810,000 gallons to 1,350,000 gallons per acre per day on the basis of design used.

It appears from the above that the proposed filter is not so designed as to give a high degree of efficiency and that it should be modified in certain respects. In the first place with the proposed arrangement for underdrainage there would be a tendency for the solids which are discharged from filters of this type to become lodged against the stones of the floor of the filter and this might ultimately cause a complete clogging of the filter. The filter should be provided with a false floor underdrain system in order to facilitate drainage and aeration and prevent clogging.

With respect to the distributing system I am of the opinion that with a spacing of the nozzles of 15 feet and a gross maximum operating head of only 5½ feet a portion of the filter would not be reached by the spray from the nozzles at all times and that the operating head on the filter should be increased and the spacing of the nozzles decreased, in order to get a more uniform distribution of the sewage over the entire area of the filter. It is very unusual to find a spacing of nozzles in sprinkling filters of more than 13½ feet even with operating heads in excess of 7½ feet. If the changes suggested above were made in the design of the filter I believe that the area of the sprinkling filter could be so reduced as to provide for a rate of operation of 300,000 gallons per acre per day per foot of depth of filtering material.

Although the effluent from properly constructed and operated sprinkling filters is usually stable, the solids which are periodically given off from filters of this type are not always stable and sometimes give rise to considerable nuisance caused by their putrefaction. It is usual therefore to pass the effluent from sprinkling filters through short period detention settling tanks in order to remove the larger solids in suspension. It will probably not be necessary to construct such a tank at the first installation but the village should be required to provide for a final settling tank if upon operation it is found that objectionable conditions are created in the creek by the discharge of effluent into the stream.

A temporary sludge bed having an area of 1,000 square feet is shown by dotted lines on the general plan of the disposal plant. This bed which is to treat the Imhoff tank sludge is located on the bank of Cayuga creek, and the report of the designing engineer states that due to flood conditions in the creek the sludge bed will probably be washed away every spring. It is planned, therefore, to construct a temporary bed filled with gravel or cinders at the point shown by the plans for the present and later, if necessary, construct a retaining wall and permanent bed. No details of the proposed bed are shown.

The proposed arrangement for the disposal of sludge is not satisfactory and the sludge bed planned is too small. A permanent sludge bed having an area of not less than 300 and preferably not less that 350 square feet per 1,000 persons served should be provided for. Detailed plans of such bed should be furnished and such plans should show both the inlet and outlet pipes of the bed. It should either be protected from flooding or should be located at a sufficiently high elevation to prevent inundations. Placing the bed at a higher elevation would probably require either pumping the sludge or raising the elevation of the settling tank. The latter alternative would in all probability require that the sewage be pumped before entering the settling tank rather than after leaving the tank and it would appear that such a change would be desirable in view of the depth of the tank and the condition of material in which it is to be constructed.

In conclusion I would state that although the disposal plant in general appears to have been designed to meet the local requirements for sewage disposal the plant as a whole is not well balanced and there are certain changes, additions or modifications as noted above which should be made in the plans before the final acceptance of them. Consideration should also be given to the advisability of decreasing the depth of the settling tanks, reducing the capacity of the sludge compartments and so changing the proposed scheme of pumping the sewage as to provide for pumping before the settling tank rather than after the settling tank. This latter provision would permit of locating the sludge bed above the high-water mark of the stream and at the same time allowing the sludge to be discharged to it by gravity flow.

I would therefore recommend that the plans be not approved and that they be returned for revision in the following respects:

1. The plans should show the maximum high-water mark of Cayuga creek.
2. The effluent pipe from the disposal plant should be extended below the low-water mark of the stream.
3. Details of the screen at the pumping station designed with bars spaced not less than one inch apart in the clear should be submitted.
4. Duplicate power and duplicate pumping equipment should be provided at the pumping station.
5. The slope of the bottom of the sludge compartment should be increased to not less than one vertical to two horizontal.
6. The plans of the permanent sludge drying bed having an area of not less than 300 square feet and preferably not less than 350 square feet per 1,000 persons served should be submitted and the plans should show this bed in such a location that it would not be affected by high water.
7. The sludge pipe should be shown extending to the sludge bed and should be so designed as to permit of cleaning and inspection.
8. The size of the dosing siphon should be shown on the plans and the dosing tank should be designed with sloping sides.
9. A false floor underdrain system should be provided in the sprinkling filter in place of the proposed layer of large stones.
10. The operating head on the nozzles of the sprinkling filter should be increased or the spacing of the nozzles should be reduced, or both of these modifications made.

ALBANY, N. Y., *May* 25, 1914

These plans were accordingly returned for revision on May 28, 1914.

Plans for sewage disposal for the village of Depew revised in accordance with the above requirements were submitted to this Department for approval by the village engineer on behalf of the board of trustees of the village on August 28, 1914.

It appears from our examination of these plans that the two main outfall sewers are to discharge into the pumping station upon reaching the disposal plant from which the sewage is to be pumped into the settling tank and not flow by gravity to the tank as provided for by the original plans. This arrangement permits of raising the settling tanks and will effect a considerable saving in excavation inasmuch as the plans seem to indicate that rock will be encountered above the bottom of the tank. The tank has also been reduced in depth by 4½ feet without reducing the capacity of the settling compartment. The capacity of the sludge compartment, however, has been reduced by this change from 17,000 to about 10,000 cubic feet which is in accordance with our recommendations. The gas vents of the settling tank have also been enlarged, approximately doubling the total area of these vents.

The details of the pumping station and screen chamber located in the pump house show that it is proposed to install a bar screen 10 feet wide composed of 2"x2½" bars 4 feet long and spaced 1 inch apart in the clear and also show that the pumping station is to be equipped with a centrifugal pump to be driven by an electric motor instead of the plunger type of pump and electric motor as shown on the plans as first submitted. A note on the plans shows that it is proposed to install a duplicate pump and a gas engine in the pumping station which should give a reasonable assurance of a continuous operation of the plant. The pumps at the pumping station are to have a capacity of 2,100,000 gallons per day each and will be operated against a static head of about 20 feet.

It appears from the plans that there is at present a by-pass leading from the last manhole on the 27-inch trunk sewer in Borden road to Cayuga creek by means of which the sewage may be discharged directly into the creek. Inasmuch as the proposed pumping station at the disposal plant is to be provided with duplicate pumping and power equipment a by-pass is not necessary and it should be removed.

The proposed dosing tank to be constructed in connection with the sprinkling filter is to be hopper shaped and will have a capacity of about 7,000 gallons. This tank is to be provided with a 16-inch discharged siphon by means of which the clarified effluent is to be discharged into the distributing system of the proposed sprinkling filter. A maximum head of 7 feet on the nozzles is provided for.

The proposed sprinkling filter has been modified in general accordance with the recommendations of the Department and show that the nozzles are to be spaced 13½ feet center to center against 15 feet provided for by the first plans. This should insure a much more satisfactory distribution of the sewage over the sprinkling filter. The size of the filter has also been reduced from .74 acres to .62 acres and will provide for a rate of operation of from 100,000 gallons to 1,600,000 gallons per acre per day on the basis of design used, namely a present and future population of 6,000 and 10,000 respectively and a per capita rate of water consumption of 100 gallons per day. These rates more nearly correspond with the requirements of this Department for filters of the depth shown than those originally provided for.

The plans, however, are not entirely clear with reference to the design of the underdrain system. It was recommended in the previous report that a false floor underdrain system be provided for the sprinkling filter in place of the proposed layer of large stone. A section through one of the lateral underdrains indicated that 10-inch half tiles are to be placed on the floor of the sprinkling filter parallel to the lateral underdrains. This arrangement would not facilitate draining the filter and in order to correct this it would be necessary to place the lines of half tile drains perpendicular to the lateral drains and parallel with the slope of the bottom of the filter.

The plans also provide for a permanent sludge drying bed to be located on the site of one of the existing contact beds and protected with embankment from high water of the stream. This bed is to be 85 feet long, 40 feet wide, giving an area of 340 square feet per thousand persons served for ultimate conditions, namely, a population of 10,000 persons. The bed is to be underdrained by means of lines of 3-inch tile laid with open joints and discharging into two lines of 6-inch vitrified tiles laid with slopes of .4 per cent. The main underdrain from the sludge bed is to discharge directly into the stream. Above the underdrain system is to be placed a layer of gravel or coke from 18 to 24 inches deep. No surface layer of sand is shown on the filtering material. It is important that the coarse material should be covered by a layer of sand in order to prevent the sludge when applied to the bed from filling up the voids in the coarse material and thus clogging the bed.

In conclusion I would state that it is found from our examination of the plans that they have been revised in general accordance with all of the requirements of this Department. There are, however, certain modifications that should be made in the plant when constructed.

I would, therefore, recommend that the plans be approved and a permit be issued allowing the discharge into Cayuga creek of effluent from the proposed sewage disposal plant and that the permit contain in addition to the usual revocation and modification clauses the following provisions:

> 1. That the lines of half tile drains comprising the false floor of the sprinkling filter shall cover the bottom of the entire filter and shall be laid perpendicular to the 8-inch lateral drains and parallel to the slope of the floor of the filter.
> 2. That a layer of sand be placed on the sludge drying bed before any sludge is discharged onto it.
> 3. That the existing by-pass on the outfall sewer in Borden road be removed.

ALBANY, N. Y., *September* 3, 1914

PERMIT

The permit issued in connection with the approval of these plans on September 10, 1914, contains the following conditions:

> 1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary.
> 2. That the issuance of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.
> 3. That the sewage disposal works shown by plans approved this day shall be fully constructed in complete conformity with such plans or approved amendments thereof except as provided in conditions 6 and 7 of this permit.
> 4. That only sanitary or domestic sewage and no storm water or surface water from streets, roofs or other areas shall be admitted to the sewage disposal works.
> 5. That no sewage sludge from any part of the disposal works shall be discharged into Cayuga creek or any other watercourse or body of water.
> 6. That the lines of half-tile drains comprising the false floor of the sprinkling filter shall cover the bottom of the entire filter and shall be laid at right angles to the 8-inch lateral drains.
> 7. That a layer of sand shall be placed on the sludge drying bed before any sludge is discharged onto it.
> 8. That the existing bypass on the outfall sewer in Borden road shall be removed.

DUNKIRK

Plans for proposed sewer extensions in the city of Dunkirk were approved on April 17, 1914, on condition that on or before September 1, 1914, the city of Dunkirk should submit to this Department satisfactory detailed plans for the interception and disposal of the sewage of the city. The report on the examination of the plans and the conditions of the permit issued in connection with the approval of them follow:

Plans for proposed sewer extensions in the city of Dunkirk, Chautauqua county, were submitted to this Department for approval by the city engineer on February 11, 1914.

The city of Dunkirk, which has an estimated population of about 19,000, is situated in the northern part of the town of Dunkirk on a small bay of Lake Erie. This bay is partially enclosed by a government breakwater which extends northeasterly from Point Gratiot for about three-quarters of a mile and about one-half mile from shore, forming Dunkirk harbor. The city water supply, which is an unfiltered supply, is taken from Lake Erie at a point outside the harbor about 1,000 feet from Point Gratiot and about one-half mile northwest of the westerly end of the breakwater.

The city is provided with a public sewer system which has been constructed for the most part on the combined plan and which serves the greater portion of the population. The sewage collected by this system discharges directly into Dunkirk harbor at some 20 points or at the foot of practically every street which extends down to the water front. Before the present plans were presented the only plans submitted to or approved by the Department provided for a sanitary sewer system in the first and fourth wards of the city, which plans were approved on August 26, 1908.

A permit allowing the city to proceed with the construction of these sewers, which covered an area of about 175 acres in the northeastern part of the city, was issued by this Department on September 7, 1905, following an inspection of the sewerage conditions of the city by the Consulting Engineer of the Department, which inspection disclosed the urgent need for sewers in the first and fourth wards. The necessity for the future interception and disposal of the city's sewage and the consequent desirability of a separation of the sanitary sewage and storm water was foreseen at that time and the permit referred to was issued on condition that the proposed sewers be designed as separate sewers and of sufficient capacity to carry the sanitary sewage of the district when fully built up. A further condition on which the permit was issued provided that a limited amount of storm water might temporarily be admitted to these sewers but that the use of the sewers for conveying storm water should be temporary and that the surface water inlets should be disconnected from these sewers whenever necessary.

Although practically all of the built-up portion of the city except the 175 acres in the first and fourth wards is sewered on the combined plan, there are large areas outside of the developed section of the municipality, but inside of the city limits where there are at present no sewers. It is important, in view of the necessity for the interception and disposal of the sewage of the city, that sewers in these outlying areas shall be constructed on the separate plan and that no plans for combined sewers in these districts should be approved.

The plans now submitted and under consideration provide for 1,233 feet of 8-inch sewer in Newton street between Locust street and Washington avenue and 72 feet of 10-inch sewer in Washington avenue extending from Newton street to the existing sewer in Washington avenue, which sewer discharges into the harbor at the foot of Washington avenue. The proposed sewers are to be constructed with slopes of from .78 per cent to 2.8 per cent, which should be adequate to produce self-cleansing velocities in them. A lamphole is to be installed at the upper end of the proposed sewer in Newton street and manholes are to be provided at all points of change of slope and alignment and at intermediate points not more than 450 feet apart. No storm water inlets are shown connected with these sewers.

It appears from our careful examination of the plans that the proposed sewers if properly constructed should be adequate as to size and capacity to satisfactorily care for the sanitary sewage of the section to be served by them.

The question, however, of the interception and disposal of the sewage of the city is an important matter and should in my opinion be considered at this time. This question has been before the Department for a number of years.

As noted above, the city was advised as early as 1905 of the necessity for constructing an intercepting sewer in order to remove the pollution from the harbor and the sewerage conditions of the city and the effect on the quality of the public water supply of the discharge of sewage into the harbor was fully discussed in the report of Professor Ogden on his investigation of the sanitary condition of Dunkirk in 1908. Professor Ogden states in his report that in his opinion the discharge of sewage into the harbor must be dangerous and a most probable source of pollution of the water supply and recommends the construction of an intercepting sewer along the waterfront.

On May 23, 1913, Dunkirk was visited at the request of the city officials and reviewed preliminary plans for the interception of the sewage of the city which were in progress of preparation by the city engineer and also went over the grounds with reference to the interception and disposal of the sewage. The city authorities were then advised fully as to how they should proceed to secure proper plans.

It was pointed out to them at that time the problem of intercepting and disposing of the sewage of the city would probably involve pumping the sewage, and at least its treatment in settling tanks, including sterilization of the effluent before its discharge into the lake below the city. Such procedure is essential not only for the protection of the public water supply but also for the removal of nuisances along the waterfront caused by the discharge of untreated sewage into the harbor.

In this connection it might be stated that as the result of action taken by this Department the village of Fredonia has recently prepared plans for sewage disposal for the village and has submitted the same for approval. The installation of such sewage disposal plant will not only remove the serious pollution of Canadaway creek, which discharges into Lake Erie about 1½ miles from the intake of the Dunkirk water supply system, but it will also remove one of the possible sources of contamination of this water supply. The most serious menace to this supply, however, is the sewage from the city itself.

In conclusion, I would state that the present discharge of raw sewage into Dunkirk harbor not only creates insanitary conditions in the harbor itself but is also a serious menace to the water supply of the city, and that, in view of the repeated recommendations made to the city in reference to sewage disposal, the city should be urged to take immediate steps to remove the sewage from the harbor and to so treat it as to remove largely if not wholly this source of contamination of its water supply. Any plans for interception and disposal of the sewage of the city submitted for approval should show a boundary line outside of which sewers are to be constructed on the separate plan in the future, and inside of which the city desires to continue the construction of sewers on the combined plan. Such boundary line should include approximately the developed section of the city which is now provided with sewers.

I would recommend therefore that the plans for the proposed sewer extension in Washington avenue and Newton street be approved and a permit be issued allowing the discharge into Dunkirk harbor at the foot of Washington avenue of sewage from the proposed sewers and that the permit contain in addition to the usual revocation and modification clauses the following conditions:

1. That plans for the interception and treatment of the entire dry weather flow of sewage of the city be submitted for approval on or before September 1, 1914.

2. That the plans for the interception and disposal of the sewage of the city be accompanied by a general sewer plan showing the area inside of which it is desired by the city to continue the construction of sewers on the combined plan, and outside of which the sewers are to be constructed on the separate plan in the future.

ALBANY, N. Y., *March* 13, 1914

PERMIT

The permit issued in connection with the approval of these plans on April 17, 1914, contain the following conditions:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary.
2. That the issuance of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.
3. That only sanitary or domestic sewage, and no storm water or surface water from streets, roofs or other areas shall be admitted to the proposed sewers.
4. That on or before September 1, 1914, the city of Dunkirk shall submit to this Department for approval satisfactory detailed plans showing a comprehensive system of intercepting and outfall sewers to convey to a suitable site for sewage disposal works the entire sanitary sewage of the city of Dunkirk collected by separate sanitary sewers and the entire dry weather flow of sanitary sewage of said city collected by combined sewers, together with detailed plans for sewage disposal works to treat the entire sanitary sewage of the city of Dunkirk.
5. That upon approval of said plans, when required by the State Commissioner of Health, said intercepting and outfall sewers and said works for sewage disposal shall be constructed and put in operation within the time limit which may be then specified.
6. That the plans for the interception and disposal of the sewage of the city shall be accompanied by a general sewer plan showing the boundary within which it may be desired by the city to continue the construction of sewers on the combined plan and outside of which boundary future sewer extensions shall be constructed on the separate plan.

FARMINGDALE (New York State School of Agriculture on Long Island)

Plans for water supply, sewerage and sewage disposal for the New York State School of Agriculture on Long Island were submitted for approval by the State Architect on July 2, 1914, and were approved on July 10, 1914. The sewage disposal plant provided for by these plans consists of a screen chamber, pumping station, settling tanks, electrolytic plant and broad irrigation system. Plans for a modification of a portion of the electrolytic sewage disposal plant were submitted for approval December 23 and were approved on December 24, 1914.

The proposed institution which is to cover an area approximately one-half mile square is to be located about two miles northeast of Farmingdale. According to the report of the State Architect, it appears that the institution will probably open in the spring of 1915 when it will have a population of about 300. The maximum ultimate population is estimated at about 1,000 and the corresponding average daily water consumption at about 100,000 gallons per day.

The water supply for the institution is to be obtained from 8-inch driven wells located near the power house in the northwestern portion of the property. The water is to be raised from the wells by means of air lifts and discharged into a concrete reservoir having a capacity of about 36,000 gallons. From this reservoir the water is to be pumped directly into the main distributing system consisting of pipes varying in size from 4 to 8 inches in diameter. The surplus water will be pumped into an elevated tank about 63 feet high located on a hill about 65 feet above the general level of the ground of the institution. No data are presented as to the capacity of this elevated tank.

The surface or storm water is to be collected by means of an independent system of storm water sewers varying in size from 8 inches to 22 inches in diameter. The storm water collected by the sewage is to be discharged on the surface of the ground near the Amityville and Huntington road to the southeast of the institution.

The sanitary sewage from the institution is to be collected by a system of 6-inch and 8-inch sanitary sewers by means of which it is to be conveyed to the proposed sewage disposal plant to be located in the northwestern part of the property. These sewers are to be constructed with slope sufficiently steep to produce self-cleansing velocities under ordinary conditions and will be provided with manholes at all points of change of slope and alignment. If properly constructed they should be adequate as to size and capacity to satisfactorily care for the sanitary sewage of the school.

One of the lines of the sewers, however, between manholes J and K runs in comparatively close proximity to the proposed wells through which the water supply of the school is to be derived and a portion of this sewer is to be located at a depth of some 17 feet below the surface of the ground. I believe, therefore, that in order to protect the water supply from contamination from this source, this portion of the sewer and all connections to the sewer between manholes J and K should be constructed of cast iron pipe with lead joints.

The sewage upon reaching the disposal plant will be discharged from a valve manhole into either or both compartments of the proposed pump well. In the corner of each of the pump wells is to be located a screen chamber 3 feet wide x 7 feet long which is to contain a bar screen composed of ⅜" x 2" bars spaced 1¼" part in the clear. The pump wells have sufficient capacity to care for an average flow of sewage of about 2¼ hours.

The screened sewage is to be discharged against a static head of about 25 feet into the first of three settling tanks by means of two 4-inch centrifugal pumps located in a dry-well adjacent to the pump wells. These pumps are to be driven by electric motors. I am of the opinion that either an independent engine and generator or an independent gas engine and pump should be provided for in order to insure a continuous operation of the plant in case of a failure in the supply of electric current.

The proposed settling tanks which are similar in design are to be 20 feet in diameter and 22 feet deep with a depth below the flow line of from 18½ to 20 feet. Tank No. 1 is to be used as a receiving or preliminary settling tank, tank No. 3 as a final settling tank for the electrolyzed effluent and tank No. 2 is to be used in the place of or in addition to settling tanks Nos. 1 and 3. Each tank has sufficient capacity to give a time of detention to the sewage of from 6½ to 7 hours.

Each settling tank is to be provided with a 6-inch cast iron sludge pipe which is to extend to a point near the apex of the cone-shaped bottom of the tank. These pipes will act as suction pipes for the sludge pump which is to pump the sludge to a proposed filter press. No statement is made in the report of the State Architect as to the disposal of the sludge after pressing. It would seem that the approval of the plans should carry with it the condition that no sludge should be deposited or discharged into any stream, watercourse or other body of water and that the sludge from tank No. 1 which is not to be sterilized should not be used for fertilizer in such a way as to contaminate vegetables which are to be eaten raw. I would further recommend that one of the conditions of the approval of the plans be that no sludge from any part of the disposal plant be deposited within 1,000 feet of the wells from which the water supply is to be derived.

The clarified effluent is to be pumped through 4-inch pipes from either or both of the first two settling tanks to the electrolyzers, which are to be located in a brick building about 21.5 feet x 40 feet in plan. This building will also contain a sludge pump and a sludge filter press. The electrolyzers are to be installed in duplicate and according to the report of the State Architect each unit has been designed to care for the average daily flow of sewage. From the electrolyzers the sewage is to flow by gravity through an 8-inch pipe into plowed furrows of a broad irrigation field having an area of about 8 acres.

The disposal field is to be located not less than 1,000 feet from the proposed wells and it is not probable that the quality of the water will be affected by the proposed method of disposal, provided the disposal plant is properly constructed, operated, and maintained. The general slope of the ground and the probable direction of the flow of the ground water is from the proposed wells toward the disposal field. The continued pumping from the wells, however, will probably lower the ground water level in the vicinity of the wells and bring the entire institution property within the cone of depression of the ground water.

It is obvious then that it cannot be foreseen in advance what the underground hydrographic condition will be nor to what extent, if any, the sanitary quality of the wells may be affected by the sewerage and sewage disposal system. Great care will, therefore, have to be exercised in the construction and operation of the sewer system and sewage disposal plant. The water supply of the college will be analyzed regularly at least twice each year by this Department as provided by law and opportunity will thus be afforded to determine and correct any adverse effect on the water supply resulting from the arrangements for sewage disposal as proposed.

According to the report of the State Architect the proposed electrolytic plant is somewhat of an experimental plant and its operation will be carefully watched by this Department to determine its efficiency. In the absence of details of the electrolyzers and description of their operation, no attempt has been made to discuss in detail this portion of the plant and on account of the experimental nature of the plant, such complete description of its efficiency cannot obviously be given.

In view of the above, I would recommend that the plans be approved on condition that some other method of disposal, such as sand filtration be substituted at the institution if the proposed method of disposal proves to be unsatisfactory and that the other suggestions of this report regarding conditions of approval be carried out.

ALBANY, N. Y., *July* 2, 1914

The following communication was addressed to the State Architect by the Commissioner of Health on July 10, 1914:

These plans are approved under the following conditions:

1. That the sewer between manholes I and K and all connections with this sewer between these points shall be constructed of cast-iron pipe with leaded joints.
2. That no sewage sludge from any part of the sewage disposal works shall be discharged into any watercourse or body of water nor at any point within a distance of 1,000 feet from the wells furnishing the water supply for the Agricultural College.
3. That auxiliary or additional equipment to generate or supply power for pumping shall be installed.
4. That whenever required by the State Commissioner of Health works for sewage disposal at this institution by sand filtration or some other equally satisfactory method shall be installed and put in operation in accordance with plans satisfactory to the said Commissioner.

Amended plans for a portion of the electrolytic sewage disposal plant at the New York State School of Agriculture on Long Island, Farmingdale, were submitted to this Department for approval by the State Architect on December 23, 1914.

The letter from the State Architect submitted with the present plans states in part as follows:

> "You will note that the contractor proposed to install the electrolytic machines in a horizontal position rather than a vertical position and we are informed that experiments which have been carried on by the manufacturers since the specifications were prepared lead them to believe that this is a better arrangement of the apparatus. This of course made it necessary to enlarge the building; also you will note that each electrolytic machine is driven by a separate motor, and the motor driven generator sets, which are in duplicate, are entirely separate from the electrolytic machines. The general arrangement, however, of piping and apparatus is similar to the original specifications. You will also note that provisions have been made for storing the lime and definite details are worked out on this drawing showing elevations of mixing tank, etc. The contractor proposes to make these changes without additional expense to the State, and as the excavation is now complete, I, therefore, submit these drawings for your approval."

The plans now submitted show a plan and cross section of the electrolytic plant and embody the changes noted above. The building containing the electrolytic machines and auxiliary equipment is to be increased in size from 40′ 4″x21′ 4″ to 40′ 4″x26′ 7″. The settling tanks and other portions of the proposed disposal plant shown by the approved plans are not shown and it is assumed that no changes are to be made in the disposal plant except as shown by the present plans.

I am of the opinion, therefore, that approval of these amended plans might consistently be given inasmuch as they do not provide for any radical changes in the original design and since plans for sewage disposal including electrolytic treatment of the sewage of the institution have already been approved. I believe, however, that the amended plans if approved, should be approved on the same condition on which the original plans were approved.

ALBANY, N. Y., *December* 24, 1914

FREDONIA

Plans for sewerage and sewage disposal for the village of Fredonia were submitted for approval on March 7, 1914, and after a careful examination of the plans they were returned for modifications on April 6, 1914. Plans revised in general accordance with the recommendations of this Department and providing for a sewage disposal plant consisting of septic tanks, contact beds and sludge beds were resubmitted for approval on April 14, 1914, and were approved on April 16, 1914. The reports on the examination of the plans and the conditions of the permit issued in connection with the approval of the same are given below.

Plans for combined system of sewers and sewage disposal works for the village of Fredonia, Chautauqua county, covering the whole of the village, were submitted by the board of trustees on March 7, 1914.

The records of the Department show that an inspection of the sewerage conditions in the village of Fredonia, with special reference to the need of sewers in Orchard street, was made by a representative of this Department in August, 1913. In the report upon this inspection it was recommended that the village board of health take action under section 21-a of the Public Health Law to provide adequate sewerage facilities for the village. The board of health subsequently made application for the approval of the proposition to extend the sewer system of Fredonia. The application was approved on September 13, 1913, and on November 12, 1913, plans for a proposed sewer extension in Orchard street were approved. The conditional permit issued in connection with the approval of the plans requires that detailed plans for intercepting and outfall sewers and disposal plant be submitted to this Department for approval on or before January 1, 1915, and the present plans have been submitted in accordance therewith.

The plans now submitted were prepared by the Frederick K. Wing Co., engineers, and comprise tracings and white prints of the following plans:

1. Eleven sheets showing profiles of sewers
2. General map of sewer system
3. General layout of disposal plant
4. Details of settling tanks
5. Details of distributing chamber, etc.

The report of the engineer states that it is proposed to build an intercepting sewer to collect the sewage from the present combined sewer system and conduct it to a sewage disposal plant. Overflow weirs are to be so placed and regulated that the sewers will take care of practically all of the storm water at present, but as the population of the village increases and the sewer system is extended, these weirs will be lowered so as to include less storm water. It is the intention of the village authorities to immediately construct the intercepting sewer and disposal plant and a few of the sewers. All new sewers are designed as sanitary sewers, storm water being excluded.

In designing the sewerage system a density of population of fifteen persons per acre was used for outlying districts, fifty per acre for the central portion of the village and thirty per acre for all other districts.

The village of Fredonia is situated in the northern part of the town of Pomfret, on Canadaway creek. It is provided with an unfiltered surface water supply taken from Canadaway creek and the works are controlled by the municipality. The village is provided with public sewers built on the combined plan serving a few streets and discharging into Canadaway creek at three outlets, one at Water street, one at East Main street and the principal one just west of Risley street.

The present population of the village according to the engineer's report is approximately 5,660. The increase in the population of the village has been moderate and, based on this growth it is estimated that the population to contribute sewage from the sewer district in twenty years will be approximately 7,000.

The plans provide for one outfall which will discharge the effluent from the proposed sewage disposal plant into Canadaway creek at a point about 1,200 feet below Matteson street in the northwestern part of the village.

The minimum size of all new sewers is 8 inches but in several of the laterals at present installed are 6-inch sewers, which, however, are laid on grades sufficiently steep to prevent clogging and the sewage contributed to these short laterals will probably not be greater than their capacity. The proposed sewers range in size from 8 inches to 30 inches just before the trunk sewer enters the disposal plant. The sewers are apparently of sufficient capacity and are to be laid on slopes sufficient to care for the sewage which will be ultimately contributed to them. The size and grades of the intercepting sewer from overflow weir A to the point where it enters Forest Place is not given on the general plan. This sewer is apparently not shown on the profiles.

Manholes are placed at every change of grade or alignment. The maximum spacing between manholes in the sewers at present installed is 716 feet and in the new sewers it is 470 feet. An average spacing of less than 400 feet is maintained generally throughout the system and the above maximum spaces occur on grades which are probably sufficient to prevent clogging between manholes.

Flush tanks are placed at the upper ends of all laterals of the new system but in the old system they are not provided. The examination of the grades of these sewers would seem to indicate that the slopes are sufficiently steep to prevent clogging of the sewers.

Inverted siphons are to be placed in the sewer system at three points to carry the sewage of the south side of the creek to the northern side on which the disposal plant is located. These siphons occur at Water street, West Main street and Matteson street. In the profiles the siphons are indicated as to location and elevation but details of the construction and arrangement are not given on the plans.

An overflow weir is at present located near the intersection of East Main street and Center street in order to allow excess storm flow to be discharged through the Main street sewer into Canadaway creek and not overtax the Risley street sewer, the dry weather flow of sewage reaching the manhole at this point passing to the plant below Matteson street. Overflow weirs are to be installed at the present East Main street outlet and at the Risley street outlet while the present Water street outlet is to be closed. It is the intention of the Designing Engineer to allow at present a considerable amount of storm water to reach the disposal plant since the dry weather flow will not approach for a long time the capacity of the plant. As the dry weather flow increases in volume the overflow weirs are to be lowered so as to divert more of the storm flow from the trunk lines leading to the disposal plant.

It is proposed to treat the sewage collected by this system in a sewage disposal plant located just below Matteson street in the northwestern corner of the corporation. The site is a considerable distance from the closely built up section of the village and lies upon the northern bank of Canadaway creek. This stream has a drainage area above this point of approximately 33 square miles consisting mostly of mountainous country. The stream above is used for water supply purposes by the village of Fredonia itself which takes its water from a western branch of the creek. The stream empties into Lake Erie about 2 miles below the outlet of the disposal plant. The city of Dunkirk derives its public water supply from a point in the lake about 1½ miles northeast of the mouth of Canadaway creek. This supply is unfiltered.

The site of the sewage disposal plant is situated at apparently the most advantageous point available in the corporation. It lies on the north bank of the creek and as the largest part of the village is situated upon the northern side, the minimum amount of sewage will have to be carried across the creek. The elevation of the plant is evidently sufficiently high above the waters of the creek to allow the operation of the plant by gravity at all times and such that only an extremely high flood would inundate the plant.

The sewage at the present time will consist of a considerable amount of storm water contributed from those streets in which the present combined sewers are located. The sewage upon reaching the disposal plant passes first through two grit chambers for the removal of the grosser solids. Each chamber has a volume of about 764 cubic feet (about 5,728 gallons). A diverting manhole is so placed that the sewage entering the plant can be diverted into either or both of the grit chambers. For the total present population assuming 100 gallons sewage contribution per capita per day and that one half of the daily flow is contributed in 8 hours a period of detention in each chamber of about 9.5 minutes and in both of about 19 minutes is obtained. For the future population and same assumptions the detention periods will be 7.5 and 15 minutes.

The side of the grit chamber opposite the inlet is taken up by removable iron screens of 1-inch by ¼-inch bars spaced 2 inches center to center. These screens are to have a chain attached to them by which they can be raised for cleaning.

After passing through the screens the sewage passes through submerged rectangular openings 20 inches by 44 inches into four settling tanks which are to be built as part of the same structure. The settling tanks as well as the grit chamber are to be built of reinforced concrete and roofed with concrete supported by columns and beams of the same materials. The settling tanks are rectangular in plan arranged so that they can be operated in pairs. In a sump in the sloping bottom of each tank is located a valve connecting with a 6-inch cast-iron sludge pipe through which the sludge passes to the sludge bed. At the outlet end is located a 4-inch reinforced concrete baffle extending to within about 2 feet of the bottom of the tank. No baffle is apparently provided at the inlet end of the tank. The sludge pipe from the settling tanks passes under the settling tanks and under contact bed No. 4 to the sludge bed. Should clogging ever occur in this pipe, it could be reached only with difficulty and it would therefore seem better to run the sludge pipe around the tank and contact bed on the northern side.

The settling tank has a capacity of about 113,000 gallons below the flow line, which for the present population will give a period of detention of the sewage in the tank of about 10 hours and of about 8 hours for the future population on the usual assumptions regarding per capita sewage contribution per day. The average velocity of flow through the tank will be about .0025 feet per second based on the above assumptions.

From the settling tanks the effluent flows into a distributing chamber about 54'x11'6" in plan, while four 8"x18" Adams feeds, each located in a separate compartment, distribute the sewage onto each of four contact beds in rotation.

The contact beds have bottoms and sides of reinforced concrete. The beds are 5.2 feet deep from the top of the stone and 5 feet deep from the elevation of the sewage level in the beds. The four beds, which are each about 0.35 acres, have a combined area of about 1.4 acres, giving a rate of application of about 404,000 gallons per acre per day for the present population and about 500,000 gallons per acre per day for the future population. The beds are to be filled with crushed stone or clean coke. The distributing and underdrain systems consist of split 12-inch tile pipes. The beds discharge by means of timed Miller siphons into Canadaway creek.

The sludge from the settling tanks is to be discharged by gravity into a sludge bed, the area of which is about 8,000 square feet, which will give about 1,000 square feet per 1,000 persons for the future population. The filtering material of the sludge bed is to consist of sand 1 foot 6 inches deep. Three-inch agricultural tile laid 5 feet apart, center to center, collect the effluent and discharge it into the main effluent pipe from the contact beds. On the plans, the sand is laid directly on the underdrains. If laid in this manner the sand would probably wash into the underdrains and clog them. The underdrains should be surrounded by at least 6 inches of gravel or crushed stone.

Except in regard to two of the more important minor features of the design of the sewage disposal works, namely, the proposal to construct the sludge pipe from the settling tank under the contact beds and the failure of the plans to show the underdrains of the sludge bed to be surrounded with gravel, both the sewer system and sewage disposal works might be considered to be well designed were it not for the fact that it is intended to retain as a part of the proposed general sewer system, a portion of the present system which is constructed on the combined plan, carrying both storm or surface water and sanitary sewage. This portion of the system amounts to less than 5 per cent. of the system over the entire village.

Considering the suitability of the design it should be stated that there exists, at present, a constant menace to the sanitary quality of the water supply of the city of Dunkirk by reason of the discharge of sewage from Fredonia under the conditions referred to elsewhere in this report. Furthermore, on account of the relatively small flow in Canadaway creek conditions of general nuisance and injury to riparian rights from sewage pollution of this stream now exists which, because of the retention of combined sewers as a part of the project for sewerage and sewage disposal presented for approval, would only partially be removed by the proposed scheme for sewerage and sewage disposal for Fredonia.

It is apparent that the desirability of doing away with the discharge into the stream within the village limits of combined sewage has been appreciated by the village authorities in previous sewer construction and extensions and the limited flow of the stream requires that such discharge be eliminated for a proper sanitary condition within the village.

The report of the designing engineer states that the present system is a combined system for a few of the streets having storm water catch basins leading into the sewers on East Main street, Central avenue, Temple street, Center street, Railroad avenue and that the present sewers have three outlets into the creek, one at Water street, one at East Main street and the principal one just west of Risley street. In the proposed plant two of these overflow or outlet sewers carrying combined sewage are to be retained but the third one, the one at Water street, is to be eliminated.

It is apparent that comparatively little additional sewer construction over that provided by the plans by way of providing storm water sewers or providing sanitary sewers in streets in which combined sewers are now constructed such as East Main street, Temple street, Center street and Railroad avenue would be required to provide for the elimination of all storm water from the sanitary sewer system and sewage disposal works. After a careful consideration of the conditions I am convinced that such a step to revise the sewer system of the village should be taken at this time and not deferred until the comparative cost would be much greater than at present.

I consider that such elimination of storm water from the sanitary sewer system and sewage disposal works proposed is essential not only with respect to protecting the quality of the water in Canadaway creek below the village but that the separation of sanitary sewage and storm water is of very great importance to the village of Fredonia itself in order to eliminate the discharge of combined sewage into the stream and restore it at all times to a sanitary condition.

In view of the results of our examination of these plans and after careful consideration of the essential features of the design and of local and general requirements with respect to proper methods of sewage disposal I am of the opinion that the plans should not be approved until they have been revised to show complete separation of sanitary or domestic sewage from storm water or surface water.

I beg to recommend therefore, that these plans be returned for revision in the following respects:

1. That the plans be so revised that no storm or surface water be admitted to the proposed sanitary sewer system or sewage disposal works, this provision being necessary since any permit issued will provide that no storm water be admitted to any sewer carrying sanitary sewage or to the disposal works.
2. That the sludge pipe from the settling tank to the sludge bed be laid outside of the settling tank to the contact beds instead of under them.
3. That the underdrains of the sludge beds be surrounded by at least 6 inches of coarse gravel or crushed stone.
4. Details of the outlet sewer crossing Hart street should be shown.

ALBANY, N. Y., *March* 27, 1914

The plans were returned for revision on April 6, 1914.

Revised plans for sewerage and sewage disposal for the village of Fredonia were resubmitted to this Department for approval on April 14, 1914.

Our examination of the plans now presented shows that they have been revised in accordance with all of the above requirements. The supplementary report of the Designing Engineer states that since the preparation of the original report he has made further investigation with reference to the disposal of storm water in the village and has learned from former trustees and old residents of the community that catch basins in Railroad avenue and East Main street empty into a storm water sewer but not into a sewer carrying sanitary sewage as was first reported. This storm sewer he states connects with a sewer carrying sanitary sewage in the lower portion of East Main street between Forest place and Canadaway creek, making a combined sewer out of only the lower portion of the East Main street sewer. The revised plans submitted show that it is proposed to abandon the connection of this storm sewer with the sanitary sewer in East Main street and continue the storm sewer to the creek, a distance of 850 feet.

The report also states that the catch basins at Central avenue, Temple street and Center street west of Terrace street empty into the storm water drain which extends from a point near East Main street to Canadaway creek crossing White street, Free street, Day street, Central avenue, Temple street, Terrace street, Center street and Forest place. The revised plans show this storm water drain and catch basins connecting with it as well as the method of caring for the storm water in Church, Risley and Center streets.

At Church street the catch basins are to be connected with the present storm sewer and at Center and Risley streets the catch basins are to be disconnected from the present sewers carrying sanitary sewage and are to be connected with the proposed storm water sewer in Risley street. The plans also show that the present outlets to the sewer system at Water street, East Main street and the main outlet below Risley street are to be closed.

It appears therefore that the plans as revised provide for a complete separation of the storm water from the sanitary sewage in accordance with the requirements of this Department. The requirements with reference to the sludge pipe from the settling tank, the underdrains to the sludge beds and the details of the outlet sewer crossing Hart street have also been complied with.

I would therefore recommend that the plans for sewerage and sewage disposal for the village of Fredonia be approved and that a permit be issued to the board of trustees allowing the discharge into Canadaway creek of effluent from the proposed sewage disposal plant near the westerly corporation line in the village of Fredonia.

ALBANY, N. Y., *April* 16, 1914

PERMIT

The permit issued in connection with the approval of these plans on April 16, 1914, contains the following conditions:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary.

2. That the issuance of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.

3. That both the sewer system and the sewage disposal works shown by plans approved this day shall be fully constructed in complete conformity with such plans or approved amendments thereof.

4. That only sanitary or domestic sewage, and no storm water or surface water from streets, roofs or other areas shall be admitted to the sanitary sewers of the village and that all existing connections between catch basins or storm water inlets and the sanitary sewers shown by the plans shall be removed.

5. That no sewage sludge from any part of the disposal works shall be discharged into Canadaway creek or any other watercourse or body of water.

GOSHEN

Plans for a sanitary sewer system and sewage disposal plant consisting of settling tanks, dosing tank and intermittent sand filters were approved on January 13, 1914.

Plans for sewerage and sewage disposal for the village of Goshen, Orange county, were submitted to this Department for approval by the Board of Trustees on December 10, 1913.

The plans were prepared by Clyde Potts, Consulting Engineer of New York city, and comprise duplicate blue prints of the following:

1. Topographical map of the village showing proposed sewer system.
2. Topographical map showing location of sewage disposal works and area to be acquired by village.
3. Location map of disposal works which does not show area to be acquired.
4. Plan and sections of settling tank.
5. Plan and sections of dosing tank.
6. Plan and sections of sludge bed.
7. Plan and sections of sand filters.
8. Six sheets of profiles of sewers and streets.
9. Details of manholes.

Duplicate copies of report and specifications covering plans for sewerage and sewage disposal were also submitted.

The village of Goshen is situated in the central part of the town of Goshen about 5 miles southeast of Middletown, and is on the Rio Grande, a small stream tributary to the Wallkill river. It is provided with a public water supply taken from the upper reaches of one of the branches of the Rio Grande. The water works are controlled by the municipality and according to the report of the Designing Engineer, there are about 400 service taps on the system representing a population of about 2,000.

Although the village is not provided with a public sewer system it appears that the larger portion of the village is provided with private sewers or drains which discharge into the stream as it flows through the village. Insanitary conditions resulting from such discharge of sewage have been the subject of a number of investigations by this Department.

The present population of the village, according to the 1910 census, is approximately 3,000 and the area of the village is about 1,200 acres, giving a density of 2½ persons per acre. The growth of the population of the village has in the past been very slow, but assuming that the present population may treble within the life of the system it is estimated that the population ultimately to contribute sewage to the proposed system will be approximately 9,000.

The plans have been carefully examined with respect to the sewer system and the sewage disposal works. The design of the sewer system has been studied with reference to alignments, sizes, slopes, capacities, facilities for cleaning and inspection and flushing and other features of a hydraulic and sanitary nature. In connection with the means for sewage disposal it has been studied with reference to the general method and efficiency of the sewage disposal plant as a whole and of the capacities and operation of the individual structures, appurtenances and apparatus.

The sewer system is comprehensive, covering practically the entire village. Although it appears from the plans that it is not proposed to construct the entire system at this time no application for permission to temporarily omit or defer the construction of a portion of the system has been submitted by the village authorities as required by the Village Law.

The proposed sewers vary in size from 8 to 18 inches in diameter. The capacity of the main outfall sewer which is to be an 18 inch sewer laid with a slope of .11 per cent. will be such that it will care for the probable maximum rate of contribution of sewage, on the usual assumptions, from a population of about 9,000 which as far as can be foreseen at this time and judging from the past growth of the village should be sufficient for the future needs of the community during the probable life of the proposed sewer system.

Although the lateral sewers of the village are to be constructed with rather steep slopes the main trunk sewers are somewhat flat and will probably require frequent flushing during the early life of the system to prevent deposits from forming in them. The slopes provided are adequate, however, to give self-cleansing velocities in the sewers under ordinary conditions of flow. All the sewers are to have straight alignments between manholes which are to be placed at all points of change of slope and alignment and at intermediate its not more than 450 feet apart.

It is proposed to treat the sewage collected by this system in a sewage disposal plant located on the Rio Grande, a few hundred feet below the village line and about 2½ miles from the Wallkill river. The Rio Grande which flows through the village has a drainage area above the disposal site of approximately 3½ square miles. As noted above the water supply of the village is derived from the upper reaches of the main branch of the stream. It is estimated that the minimum flow of the stream at the disposal plant during the summer will probably not exceed the flow of sewage after the sewer system is completed and that nothing short of sand filtration, which provides for organic purification, will prevent the creation of a nuisance in the stream below the plant. The stream which at present flows through the disposal site is to be diverted through an artificial ditch which is to be constructed parallel to the railroad right of way.

The proposed disposal plant is to consist of a septic tank, dosing tank and 4 intermittent sand filters. The septic tank which is to be covered is to be 85 feet long inside and from 7 to 10 feet deep below the flow line. It is to be divided into 3 compartments respectively 10, 12 and 14 feet wide having capacities of 51,000, 61,000 and 71,000 gallons each. The total capacity of the tank will provide about 8 hours' detention for a population of 5500 and will give nearly a 15 hour detention period for the present population on the usual assumptions as to per capita rates of sewage contribution. Two of the smaller compartments will give about 9 hours' detention when serving the present population which will permit of operating the tanks alternately either singly or in pairs as planned by the engineer. It is proposed in this manner to divert the flow from one of the tanks after it has been in operation for sometime and thus permit the sludge to decompose in the tank before discharge into the sludge bed.

The proposed sludge bed is 80 feet by 40 feet in area and is to be filled to a depth of 2 feet with sand and gravel. The upper layer of the filtering material is to consist of 18 inches of sand and a lower layer of gravel '6 inches deep. The underdrain system is to consist of parallel lines of 3 inch tile spaced 4 feet on centers discharging into 8 inch underdrains which in turn are to discharge directly into the stream.

The clarified effluent from the settling tank is to be discharged into a dosing tank having a capacity of about 31,500 gallons. One dose from the tank will flood one of the sand filters to a depth of a little more than 2 inches. On one side of the dosing tank is to be located a small brick building which is to house the dosing apparatus by means of which the sewage will be discharged alternately to the different sand filters.

Each of the 4 filters shown is 210 feet by 100 feet in area equal to about ½ an acre. The filtering material is to consist of 3 feet 4 inches of sand having an effective size of .35 to .45 mm. Below the sand is to be placed a 4 inch layer of gravel surrounding the underdrains.

The distributing system is to consist of a trough varying in width from 24 to 8 inches. One trough is to extend along the center line of each filter. The underdrains are to consist of 4 inch lines of tiling spaced 6 feet apart which are to discharge into the main underdrain located in the center of the bed and varying in size from 8 to 12 inches.

The proposed filters have a combined area of nearly 2 acres and will therefore be required to operate at the rate of about 155,000 gallons per acre per day, when serving the present population. Although this rate is somewhat high it will probably be a considerable period before it will become necessary to enlarge this portion of the plant inasmuch as it is assumed that only about two-thirds of the population, or in other words, some 2,000 persons are served by the public water supply system. The rate of operation for sometime after the completion of the plant will probably not exceed 100,000 gallons per acre per day which is a moderate rate and should with proper attention give a satisfactory effluent.

From our careful examination of the plans it is found that the proposed sewerage and sewage disposal systems if properly constructed and operated should satisfactorily care for the sewage of the village. The proposed sewage disposal works if constructed in accordance with the plans and if operated with care and efficiency should produce an effluent which may be safely discharged into the stream without objection at this time. I would therefore recommend that the plans be approved and a permit be issued allowing the discharge into the Rio Grande of effluent from the proposed sewage disposal works.

ALBANY, N. Y., *January* 12, 1914

PERMIT

The permit issued in connection with the approval of these plans on Jan. 13, 1914, contains the following conditions:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary.
2. That the issuance of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.
3. That both the sewer system and the sewage disposal works shown by plans approved this day shall be fully constructed in complete conformity with such plans or approved amendments thereof.
4. That only sanitary or domestic sewage and no storm water or surface water from streets, roofs or other areas shall be admitted to the proposed sewers.
5. That no sewage sludge from any part of the disposal works shall be discharged into the Rio Grande or any other watercourse.

GREECE (Sewer District No. 1)

Revised plans for sewerage and sewage disposal for sewer district No. 1 of the town of Greece were approved on April 29, 1914, at which time a permit was issued to the sewer commissioners of the sewer district allowing the temporary discharge of sewage from the proposed sewers into the Genesee river. The report on the examination of the plans and the conditions of the permit issued are given below.

Revised plans for sewerage and sewage disposal for Sewer District No. 1 of the town of Greece, Monroe county, were resubmitted to this Department for approval by the County Attorney on behalf of the Sewer Commissioners of the District on April 20, 1914.

Plans for sewerage for this Sewer District providing for a combined sewer system were first submitted for approval on September 7, 1912. These plans, however, did not provide for any treatment of the sewage to be collected by the sewer system before its discharge into the Genesee river and in other respects were not in satisfactory condition for approval. They were therefore returned on September 13, 1912, for modifications of the sewer system and for provisions for treatment of the sewage. On November 20, 1913, amended plans providing for a sewer system designed on the separate plan were submitted for approval. It was found from our examination of these plans that they had not been revised in complete accordance with the requirements of this Department and they were again returned on December 4, 1913, with the recommendation that before they could be finally accepted they should be modified in the following respects:

1. That the slopes of the 6 and 8 inch sewers with flat gradients should be increased to not less than .6 per cent. and .35 per cent. respectively or that these sewers should be increased in size and provided with suitable slopes.
2. That the plans should provide for a preliminary treatment of the sewage of the sewer district shown in detail and that they should also show at least a possible site for supplementary or more complete treatment works.

Plans revised in general accordance with the above requirements were again submitted for approval on March 18, 1914, and showed that the minimum slopes for 6 and 8 inch sewers had been increased to .6 per cent. and .35 per cent., respectively. The plans also provided for preliminary treatment works consisting of a screen chamber and included general plans for supplementary or more complete treatment works consisting of a sedimentation tank, sprinkling filters, chlorination plant and sludge bed to be located near the lower end of the so-called Eastman sewer into which it is proposed to temporarily discharge the sewage from this sewer district.

These plans, however, provided for a diversion of the flow from the so-called Eastman sewer to the proposed preliminary treatment plant and it appeared from the plans and data previously submitted that the proposed scheme would involve not only the treatment of the sewage from the Eastman Kodak Works but also from Sewer District No. 2 for which plans had previously been approved. The plans were accordingly returned for revision on April 6, and the County Attorney advised that their approval could not be considered unless they provided for an independent sewage disposal plant for the sewer district.

The supplementary report accompanying the present plans which were received on April 20 states definitely that the only sewage discharged into the so-called Eastman sewer in Hanford Landing road extended is from Sewer District No. 2 and that this district has agreed to remove the existing 8 inch sewer whenever required and extend their sewer to the proposed sewage disposal plant for which plans have already been approved. It appears therefore that the proposed scheme does not involve the treatment of any sewage from the Eastman Kodak Works and therefore meets the requirements of the Department in that respect.

The proposed screen chamber comprising preliminary treatment works to treat the sewage from Sewer District No. 2 shown by the plans is to be divided into two compartments. Each compartment is to be 8 feet wide, 20 feet long inside dimensions and is to vary in depth from 5 to 6 feet below the flow line. An inclined bar screen composed of 1½ by ¼ inch bars spaced ½ inch in the clear is to be placed in each compartment. The sewage is to enter and leave the screen chamber over weirs and baffle boards are to be placed in front of each weir. The effluent is temporarily to be discharged into the Genesee river through the 20 inch sewer in Hanford Landing road extended.

As noted in the previous report on the examination of these plans dated December 3, 1913, it is expected that the territory to the north of the city of Rochester including Sewer Districts Nos. 1 and 2, is soon to be annexed to the city of Rochester and that the sewage from this area will then be intercepted and conveyed to the proposed sewage disposal works to be constructed by the city of Rochester near Lake Ontario about 2 miles east of the mouth of the Genesee river.

Provisions have been made by the city in the intercepting sewer and sewage disposal works to care for the sewage from this territory. Permission is now asked to temporarily allow the discharge of untreated sewage from Sewer District No. 1 into the river through the so-called Eastman sewer until such sewage shall be cared for by the city.

I believe that owing to the polluted condition of the Genesee river at present which now receives the sewage from the city of Rochester without treatment and in view of the probability that the sewage from the proposed sewer district will within a reasonable period be connected with the city sewer system and sewage disposal works permission might reasonably be granted to the sewer commissioners of Sewer District No. 1 as was done in the case of Sewer District No. 2, situated to the north of this district and for which plans were approved last year, to temporarily discharge untreated sewage into the river until such time as the city shall remove its sewage from this stream. I am of the opinion, however, that more complete treatment of the sewage along the lines indicated by the general plans in addition to that provided for by the proposed screen chamber should ultimately be required if the sewage from the proposed sewer system is not cared for by the city within a reasonable time in the future.

I would, therefore, recommend that the plans be approved and a permit be issued allowing the temporary discharge of sewage from Sewer District No. 1 into the Genesee river at the foot of Hanford Landing road extended, under the following conditions:

1. That whenever required the proposed temporary treatment works shall be constructed and put in operation.
2. That detailed plans for more complete or supplementary treatment works shown by these plans or modifications thereof shall be submitted to this Department for approval whenever required by the State Commissioner of Health, and that after the approval of them, any or all portions of such works shall be constructed and put in operation at a date then specified.

ALBANY, N. Y., *April* 28, 1914

PERMIT

The permit issued in connection with the approval of these plans on April 29, 1914, contains the following conditions:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary.
2. That the issuance of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.
3. That the sewer system shown by plans approved this day shall be fully constructed in complete conformity with such plans or approved amendments thereof.
3. That only sanitary or domestic sewage and no storm water or surface water from streets, roofs or other areas shall be admitted to the proposed sewers.
5. That when required by the State Commissioner of Health the sewage disposal plant shown by plans approved this day shall be constructed and put in operation; and when required by said Commissioner, satisfactory detailed plans for additional works for more complete treatment of the sewage of district shown generally by these plans or approved amendments thereof shall be submitted for approval and upon approval of said plans any or all portions of such additional or supplementary works for more complete treatment of sewage shall be constructed and put in operation at such time or times thereafter as said Commissioner shall designate.

GREECE (Sewer District No. 3)

Plans for a proposed sanitary sewer system for sewer district No. 3 of the town of Greece, were approved on December 18, 1914, and a permit was issued in connection with the approval of the plans on the same date allowing the discharge of sewage from the proposed sewer system into the Genesee river through the Charlotte village sewer system. The report on the examination of the plans and the conditions of the permit issued are given below.

Plans for a proposed sanitary sewer system in sewer district No. 3 in the town of Greece, Monroe county, were submitted to this Department for approval by the county attorney on behalf of the sewer commissioners of the sewer district on November 21, 1914.

The proposed sewer district comprises an area of about 30 acres located on the shore of Lake Ontario immediately west of and adjoining the village of Charlotte. The district is occupied almost exclusively by summer resid and has at present a population of about 230 persons. The estimated ultimate population is placed at some 700 persons.

The proposed sewer system provided for by the plans covers practically the entire sewer district and is to be tributary to the sewer system of the village of Charlotte through the Beach avenue sewer which discharges into the Genesee river at the foot of this street. Sewers are shown in Beach avenue and in Linden, Elm, Maple, Oak, Walnut and Pine streets of the sewer district. No sewers are shown in the Parkway along the lake shore nor in Hickory street.

It appears that the houses on Parkway can be served by the proposed sewer in Beach avenue and that the houses on Hickory street can probably be cared for by the proposed sewers in the lateral streets extending from Hickory street to Beach avenue.

All except the upper section of the sewer in Beach avenue is to be constructed of 8-inch vitrified tile pipe. The upper section of this sewer as well as the lateral sewers tributary to the Beach avenue sewer are to be 6-inch sewers. The minimum slope of the sewers provided for by the plans is .5 per cent. Although this slope is adequate under ordinary conditions to provide self-cleansing velocities in sewers 8 inches in diameter or larger, the slope of 6-inch sewers should be not less than .6 per cent. so that the slopes of all 6-inch sewers should be made not less than .6 per cent. or the sizes of such sewers should be increased to 8 inches in diameter.

A flush tank is shown at the upper end of the proposed sewer in Beach avenue and manholes are to be provided at the intersection of all sewers except the Linden street sewer with the Beach avenue sewer. The Linden street sewer is shown discharging into the flush tank at the upper end of the Beach avenue sewer. No manholes nor flush tanks are shown at the upper ends of the lateral sewers nor is a manhole shown at the point of change of alignment on the Beach avenue sewer between Oak and Walnut streets.

Manholes or flush tanks should be placed at the upper ends of all sewers in order to facilitate cleaning and inspection of the sewers and for the same reason a manhole should be installed at the point of change of alignment of the Beach avenue sewer or this sewer should be laid with straight alignment between the manholes at Oak and Walnut streets. Although no details of the proposed flush tank at the upper end of the Beach avenue sewer are shown by the plans it is assumed that it is of the usual automatic type of flush tank in which case it should be replaced by a manhole in order to prevent the intermittent back watering of the sewer in Linden street. If it is considered desirable or necessary to provide automatic flushing of the sewers a flush tank could be placed at the upper end of the Linden street sewer and at the head of the other lateral streets. It is probable, however, that except possibly in the case of the Linden street sewer it should not be necessary to install flush tanks at the upper ends of the lateral sewer.

The proposed sewers, as noted above, are to be tributary to the Charlotte sewer system and according to the application submitted by the sewer commissioners the village of Charlotte has agreed to allow the district to connect the proposed sewer system with the village system. The records of the Department show that on November 9, 1894, original plans for a sewer system of the village of Charlotte were approved and that on May 16, 1895, amendments to these plans were approved. Neither of these plans provided for the treatment of the sewage to be collected by the proposed sewers before its discharge into the Genesee river. It was presumably not considered necessary to treat the comparatively small amount of the sewage from the village so long as the city of Rochester discharged untreated sewage into this river a few miles above. Since that time the city of Rochester has taken steps to remove the sewage from the river and treat it in a sewage disposal plant near the lake shore about two miles east of the Genesee. It was therefore considered necessary in order to still further improve the sanitary conditions of the lower Genesee and to better protect the water supply taken from the lake near Charlotte to require that the village take steps to treat its sewage before discharging it into the river. The plans for proposed sewer extensions in the Martin tract and the Allen Park districts in the village of Charlotte presented for approval last January were accordingly approved on February 5, 1914, on the following condition:

That on or before February 1, 1915, detailed plans satisfactory to this Department for intercepting and outfall sewers to convey the entire sanitary sewage of the village of Charlotte to a suitable site for sewage disposal works, together with detailed plans for complete sewage disposal works to treat the entire sanitary sewage of the village shall be submitted to this Department for approval; and that after approval of said plans any or all portions of the intercepting and outfall sewers and of the sewage disposal works shall thereafter be constructed and put in operation whenever required by the State Commissioner of Health.

In order to carry out as far as practicable the plan of reclaiming the Genesee river the sewer district should either make arrangements with the village, if this has not already been done, to treat its sewage in a joint disposal plant, if possible, as provided by Section 276 of the Village Law or the sewer district should be required to treat its sewage in an independent sewage disposal plant whenever required by the State Commissioner of Health.

In view of the above and after careful consideration of the essential features of the design and of the local and general requirements with respect to the future disposal of the sewage from the proposed sewers I would recommend that the plans be approved and a permit issued allowing the discharge of sewage from the proposed sewers into the Genesee river through the Charlotte sewer system; and that the permit contain in addition to the usual revocation and modification clauses the following conditions:

1. That either a manhole or a flush tank be placed at the upper end of all lateral sewers.
2. That a manhole be provided at the point of change of alignment of the proposed sewer in Beach avenue or that the sewer in Beach avenue be laid with straight alignment between Oak and Walnut streets.
3. That a manhole be substituted for the flush tank at the intersection of the sewer in Beach avenue with the sewer in Linden street.
4. That whenever required by the State Commissioner of Health the sewage to be collected by the proposed sewers shall be treated in a sewage disposal plant either jointly with the village of Charlotte or separately in an independent sewage disposal plant constructed by the sewer district.

ALBANY, N. Y., *December* 2, 1914

PERMIT

A permit, containing the following conditions, was issued in connection with the approval of the plans on December 18, 1914:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary.
2. That the issuance of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.
3. That only sanitary or domestic sewage and no storm water or surface water from streets, roofs or other areas shall be admitted to the proposed sewers.
4. That either a manhole or a flush tank be placed at the upper end of all lateral sewers.
5. That a manhole be provided at the point of change of alignment of the proposed sewer in Beach avenue or that the sewer in Beach avenue be laid with straight alignment between Oak and Walnut streets.

6. That a manhole be substituted for the flush tank shown by the intersection of Beach avenue and Linden street.

7. That whenever required by the State Commissioner of Health, the Sewer Commissioners of Sewer District No. 3, Town of Greece shall provide for proper treatment of the sewage to be collected by the proposed sewers in accordance with plans satisfactory to this Department either by arrangement with the village of Charlotte or by constructing, separately, a sewage disposal plant, satisfactory plans for which shall be submitted to the State Commissioner of Health for approval; and after approval the works shown by said plans shall be constructed and put in operation within a time limit which may be set by said Commissioner.

GREEN ISLAND (John A. Manning Paper Co.)

Plans for a settling tank to treat the waste water from the paper mill of the John A. Manning Paper Co. at Green Island were approved on August 31, 1914, and on the same date a permit was issued to said company allowing the discharge of effluent from the proposed tank into the Mohawk basin at Green Island. The report on the examination of the plans and the conditions of the permit issued in connection with the approval of them follow.

Plans for the disposal of trades wastes from the paper mill of the John A. Manning Paper Company under construction in the village of Green Island, Albany county, were submitted to this Department for approval on July 29, 1914.

This mill is to be located in the square bounded by Center, George, Clinton and Cannon streets in the village of Green Island. According to the report submitted with the plans some 27,000 pounds of paper made largely from rope and jute are to be manufactured per day. About 3,000 pounds of lime, 700 pounds of soda ash and 1,515,000 gallons of water are to be used daily in the process. Of this amount about 1,000,000 gallons of water are to be used to clean the paper machine cylinders which together with 500,000 gallons more will be used as wash water in the beaters and washers. This waste water is to be passed through sedimentation basins before being discharged into the Mohawk basin, from which the water is to be pumped.

About 15,000 gallons of water will be used daily in the rotary boilers where the rope is cooked with an alkaline solution. It appears that this liquor will contain about 5,000 pounds of solids of which 300 pounds are in suspension and 4,700 pounds are in solution. It is stated in the report of the company that these wastes are sterile and nonputrescible, containing principally ligneous material from the Manila fiber. It is also stated that no purification of the wastes would be effected by passing them through sedimentation tanks and that the admixture of these wastes with the wash and beater water would retard the sedimentation process. This appears to be in accordance with the results of the experiments made by the Massachusetts State Board of Health in treating paper material wastes of a similar nature. It is proposed to discharge the wastes from the rotary boilers without treatment directly into the Green Island Sewer system which discharges into the Hudson river where it is stated a greater dilution will be obtained than if they were discharged into the Mohawk basin. Owing to the comparatively small amount of solids in suspension in these wastes it would appear that the treatment of these wastes could be deferred until the question of treating the sewage of the village is taken up.

To recapitulate, the total wastes that will result from the process of manufacturing paper at the mill will consist of about 1,515,000 gallons of water per day containing about 13,000 pounds of solids in suspension and solution derived from the lime and soda ash and dissolved organic matter resulting from the paper making and the preparatory treatment of the rope, jute, etc. Of this amount 15,000 gallons said to contain about 5,000 pounds of solids mostly in solution is to be discharged without treatment into the

Hudson river through the Green Island sewer system. The bulk of the wastes, or about 1,500,000 gallons, containing about 8,000 pounds of solids, one-half of which are in solution, are to be passed through three sedimentation tanks before being discharged into the Mohawk basin. This basin receives its flow from the overflow of the waste weirs on the Erie canal at Cohoes and empties into the Hudson river over a spillway and through two locks at Watervliet. The flow in this basin is probably not less than 50 cubic feet per second.

The proposed sewage disposal plant to treat the waste water of the mill is to consist of three sedimentation tanks and a sludge drying tank. Each of the proposed settling tanks is to be 12 feet x 40 feet by from 4 to 8 feet deep and is to have a bottom formed of two truncated pyramidal shaped hoppers for the accumulation of sludge. The waste from the mill is to be discharged into a distributing channel which extends across the upper end of the tanks. From this channel it will flow into the tanks under adjustable planks. The channel and planks are to be so arranged as to permit of shutting off the flow through any one of the three tanks. The clarified effluent is to flow over concrete weirs at the outlet ends of the tanks into an outlet channel and thence into an existing 30-inch brick sewer leading to the Mohawk basin. No baffles or scum boards are provided for on the tanks by the plans.

The tanks which are to be operated in parallel have a total capacity when clean of some 60,000 gallons and will give an average time of detention of about one hour when treating a flow of 1,500,000 gallons per day. It has been found that sedimentation periods of one hour will remove about 30 per cent. of the solids in wastes of this class.

The sludge is to be removed from the sedimentation tanks through 4-inch cast-iron pipes connected with the apices of the sludge hoppers. These sludge pipes are to connect with a centrifugal pump by means of which the sludge is to be pumped to a sludge drying tank located adjacent to the outlet ends of the settling tanks. According to the report submitted with the plans it is proposed to remove the sludge from the tanks each day.

The proposed sludge tank is 12 feet x 36 feet x 6¼ feet deep and is to be filled to a depth of 3 feet with filtering material consisting of a top layer of sand 1½ feet deep and a lower layer of gravel also 1½ feet in depth. The sludge is to be applied to the sludge tank through 2" x 1" holes located in the sides of the 12" x 12" wooden trough which extends through the center of the sludge tank. The bottom of this trough is to be placed level with the surface of the sand in the tank. The underdrain system is to consist of four lines of 5-inch tiles spaced 3 feet apart. These underdrains are to discharge into the 30-inch sewer referred to above and the dried sludge is to be removed to a dump located between the Erie canal and the Mohawk basin.

Assuming a 30 per cent. removal of total solids from the wastes and a 90 per cent. water content of the sludge, about 3,000 gallons of sludge would be produced per day. This would fill the sludge drying tank to a depth of about 1 foot each day if the sludge were removed daily. I am of the opinion that the sludge would probably not dry sufficiently to spade it in one day and that it will become necessary to increase the area of the sludge bed by adding additional units in order to give the sludge a longer time to drain. It was found on the inspection of the present paper mill of the company at Troy by a representative of this Department on August 24, that there is sufficient area available at the new mill to permit of installing three or four additional tanks of the size shown by the plans if necessary.

In conclusion I would state that it would appear from our examination of the plans that the proposed sewage disposal plant has been designed in general to meet the local requirements for the disposal of wastes from the paper mill, and if properly constructed and operated should produce an effluent that may be discharged into the Mohawk basin without objection at this time. It is possible, however, that some difficulty will be experienced in caring for the sludge from the settling tanks owing to the limited size of the sludge drying tank.

I would, therefore, recommend that the plans be approved on condition that additional sludge drying tanks be added whenever required by the State Commissioner of Health.

ALBANY, N. Y., *August* 25, 1914

PERMIT

A permit, containing the following conditions, was issued in connection with the approval of the plans on August 31, 1914:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary.
2. That the issuance of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.
3. That whenever required by the State Commissioner of Health additional sludge tanks, to treat the sludge from the settling tank, shall be constructed and put in operation.
4. That only waste water from the paper machines and washers and beaters, and no sanitary sewage shall be discharged into or passed through the settling tank.
5. That no sludge from any part of the disposal plant shall be discharged into the Mohawk Basin or any other watercourse.

HARRISON (Property of Hon. Oscar S. Straus)

Plans for three sewage disposal plants consisting of settling tanks, siphon chambers and subsurface irrigation systems to treat the sewage from the property of Hon. Oscar S. Straus at Purchase in the town of Harrison were submitted for approval on October 3, 1914, and were approved on November 2, 1914. No permit was issued in connection with the approval of these plans inasmuch as they did not provide for the discharge of sewage or sewage effluent into any stream or other body of water. The report on the examination of the plans follows.

Plans for sewage disposal for the property of Hon. Oscar S. Straus at Purchase in the town of Harrison, Westchester county, were submitted to this Department for approval on October 3, 1914.

These plans were first submitted for approval under date of July 25, 1914, by Charles A. Lupprian, architect, of New Rochelle, who stated that a disposal plant was being installed by him on the property of Mr. Straus at Purchase and asked for the approval of the plans. The plans, however, were not sufficiently detailed to permit of an intelligent examination of them and they were consequently returned on July 28 for modifications and additions together with a copy of the rules and regulations of the Department for the preparation and submission of plans. Amended plans for sewage disposal were subsequently received from the designing engineers on September 10, 1914, but they were again returned on account of lack of complete data. Plans prepared in general accordance with the requirements of this Department were finally received on October 3.

According to these plans and the report of the engineers submitted with the plans the property of Mr. Straus is located at Purchase in the town of Harrison near the headwaters of a small stream tributary to Blind creek. This stream flows in a southerly direction through the town of Harrison and the villages of Port Chester and Rye, discharging into Mill creek, an arm of Long Island sound. It does not appear from the records of the Department that this stream is used for potable water supply purposes below the proposed sewage disposal plants on the property of Mr. Straus.

The plans show three different sewage disposal plants, each consisting of a settling tank, dosing chamber and subsurface irrigation system. It appears that two of these plants, one of which serves a residence and the other the stable, were on the property when it was acquired by Mr. Straus. One of these plants, serving the stable, is to be reconstructed. The third plant is to serve the so-called Hochstadter House and is a new plant.

report of the designing engineers, the soil at the disposal plant sites consists of a top soil of loam from 18 inches to 24 inches in depth below which the soil becomes harder and harder until hard-pan is reached at a depth of from 2 to 3 feet below the top soil.

The plans for one of the existing sewage disposal plants show that the sewage from one of the residences on the property is conveyed to a covered settling tank of the plant through some 500 feet of 6-inch sewer. No details of the sewer, such as slopes and grades, are shown. The settling tank is a single compartment tank 15 feet long, 4 feet wide and 6 feet deep below the flow line and has a capacity of about 2,700 gallons. The report of the engineer states that this tank will serve an average population of 15 persons and will therefore give an average time of detention of the sewage of nearly two days on the usual assumption as to per capita rate of sewage contribution.

The clarified effluent from this settling tank is to flow into an adjacent dosing chamber provided with an automatic discharge siphon. This siphon provides for the intermittent discharge of the sewage into a two way gate chamber from which the flow may be diverted to either of the two sections of the subsurface irrigation system into which the disposal field is divided.

The distributing system of the disposal field consists of about 2,000 feet of 5-inch double irrigation tile laid with open joints in trenches on a slope of .1 per cent. The tiles are to be surrounded with broken stone and the joints are to be protected with strips of tar paper. The top of the tile is shown 10 inches below the surface of the ground. The lines of the distributing system are spaced about 5 feet apart and cover an area of nearly .27 acres. It appears, therefore, that about 140 feet of tile per person and a rate of operation of 5,500 gallons per acre per day are provided for by the plans.

The disposal plant for the stable is of similar design to the plant described above except that it is somewhat smaller. The settling tank has a capacity of some 1,600 gallons and the two sections of the subsurface irrigation system contain according to the engineer's report 500 feet of distributing tiling each. It is now proposed to add an additional field containing 600 feet of tiling making a total of 1,600 feet of distributors. The population to be served by this disposal plant is not given, so that it is not possible to determine the rate of operation of the different portions of the plant.

The proposed sewage disposal plant for the Hochstadter House is to consist of a covered circular settling tank, a dosing tank, a three way gate chamber and a subsurface irrigation field divided into three sections. The sewage is to be conveyed to the settling tank through a 6-inch sewer, 130 feet long. The tank is to be 7 feet in diameter and 6 feet deep below the flow line and will give a time of detention of 24 hours when serving the estimated population of 17 persons. From the settling tank the clarified sewage is to be conveyed to the proposed siphon tank located near the disposal field through 385 feet of 6-inch sewer.

Although there are no profiles of these sewers nor any slopes shown on the general plan it appears from the detailed plans of the settling tank that the sewer leading from the house to the tank is to have a slope of 1 per cent. and that the sewer between the settling tank and the dosing chamber is to be laid with a slope of only .3 per cent. The proposed slope of .3 per cent. is too flat to insure self-cleansing velocities in a sewer of this size even though it is to carry clarified sewage only. It would seem that the slope of the sewer leading to the settling tank could be decreased somewhat without decreasing the efficiency and that the grade gained thereby could be made available for the outlet sewer.

The subsurface irrigation field is to cover about .35 acres and will contain about 3,000 feet of distributing tile. A rate of operation of about 5,000 gallons per acre per day and some 175 feet of tiling per person are provided for.

In conclusion I would state that it would appear from our examination of the plans that although they are somewhat lacking in details and the conditions of the soil on the property as described are somewhat adverse to the method of disposal proposed, it is probable that the sewage disposal plants, if properly constructed and operated, will successfully care for the sewage from the property. It appears from the plans, moreover, that the subsurface irrigation fields are so located as to permit of extending them should they become overtaxed.

I would, therefore, recommend that the plans be approved on condition that the slope of the proposed sewer between the settling tank and the dosing tank in connection with the Hochstadter plant be increased to not less than .4 per cent. It should not be necessary, however, to issue a permit in connection with the approval of these plans inasmuch as they do not provide for the discharge of sewage or sewage effluent into any stream or other body of water.

ALBANY, N. Y., *October* 23, 1914

HORNELLSVILLE (Steuben Sanatorium)

Plans for a sewage disposal plant consisting of a settling tank, precipitation tank, siphon chamber and subsurface irrigation system to treat the sewage from the Steuben sanatorium in the town of Hornellsville near the city of Hornell were submitted for approval on Sepember 23, 1914. The plans, however, were not in satisfactory condition for final acceptance and were therefore returned for modifications on October 1. Plans revised in accordance with the requirements of this Department were resubmitted for approval on October 23, 1914, and were approved on November 2, 1914. No permit was issued in connection with the approval of the plans inasmuch as they did not provide for the discharge of sewage or sewage effluent into any of the waters of this State. The reports on the examination of the plans follow.

Plans for sewage disposal for the Steuben sanatorium near Hornell in the town of Hornellsville, Steuben county, were submitted to this Department for approval on September 23, 1914.

According to the report of the designing engineer the institution is located on high ground just beyond the city limits of Hornell. It has a population of from 60 to 125, including patients, officers, and attendants. The water consumption is estimated at 100 gallons per capita per day which does not include laundry wastes inasmuch as no laundry work is done at the institution. The sewage of the sanatorium is at present discharged into a small stream tributary to Dead river and it appears from the engineer's report that insanitary conditions are created by the discharge of sewage into this stream.

It is now proposed to care for the sewage from the institution in a sewage disposal plant consisting of a settling tank, precipitation tank, dosing chamber and subsurface irrigation system. The soil at the disposal plant is said to consist of a 20-foot stratum of sand and gravel overlying hard pan.

The proposed settling tank is to be covered and is provided with submerged inlets and outlets. A manhole is shown over the inlet of the tank on the cross section but is not shown on the plan so that its exact location and size cannot be determined. If this manhole is to be circular with a diameter of two feet it will not be sufficiently large to permit of a man entering the tank for the purpose of cleaning and inspection inasmuch as the vertical section of the 12-inch inlet pipe would obstruct the passage into it. The tank is rectangular in plan with a trapezoidal cross section. It has sufficient capacity to give a time of detention of from 7½ to 13 hours on the basis of design used.

From the settling tank the sewage is to flow through submerged outlets into a second chamber located between the settling tank and dosing chamber. This chamber which has a triangular cross section is designated on the plans as a precipitation tank which would indicate that chemicals are to be used in the treatment of the sewage. No statement is made by the report, however, as to the nature and amount of the chemicals to be used, if any, nor as to the function of this chamber.

The clarified effluent, according to the plans, is to flow into the dosing chamber through submerged inlets. This chamber has a capacity of about 1,700 gallons and the tanks are so arranged that when the dosing chamber is emptied, the liquid in the precipitation and settling tanks will be drawn down about three inches, thereby augmenting the dose discharged by the siphon. In the dosing chamber is shown a 6-inch siphon consisting of a double goose neck ending with a short run of straight pipe which terminates in a rectangular chamber adjacent to the dosing tank. The siphon if constructed in accordance with the plans would not act as an intermittent discharge siphon nor provide for the emptying of the dosing chamber at each discharge but would simply allow the sewage to flow through it into the outlet chamber and the subsurface irrigation system at the same rate at which the sewage enters the tank.

The distributing system of the irrigation field is not shown in detail by the plans but according to the report of the designing engineer it is to consist of 3,500 feet of 4-inch agricultural tile which would provide for from 28 to 58 feet of tile per person served by the system. As far as can be ascertained from the general plan which shows only a portion of the subsurface irrigation system, the irrigation field is planned to cover an area of nearly .6 of an acre and will therefore be operated at a rate of from 10,000 to 20,000 gallons per acre per day.

The distributing system of the disposal field is to consist of 6 lines of 4-inch vitrified tile extending from the outlet chamber and 6 lines of 4-inch lateral agricultural tiles laid with open joints at right angles to the vitrified tile pipe. The laterals are shown running nearly parallel with the contours and from seven to ten feet apart. Three of the lines extend in one direction and the other three lines in the opposite direction. If it is found necessary to have right angle turns on the distribution system the vitrified tile pipe with cement joints should be used for several feet beyond the turn in order to prevent blowouts at these points.

According to the report of the engineer the tiles are to be laid very nearly level in trenches 1 foot wide and from 18 to 24 inches deep. The joints of the tiles are to be protected with tar paper and the trenches are to be filled with broken stone to a depth of 4 inches above the top of the tiles. Three of the six lines of lateral distributing tile are shown in full by the plans. Each of these lines is about 400 feet long. It appears, therefore, that each of the three other lines, only a portion of which are shown, would have an average length of nearly 800 feet.

I am of the opinion that all of these lines are entirely too long to permit of a uniform distribution of the effluent through the entire disposal field and that the lateral lines in this case should not be more than, say, 200 feet long. The distributing system should preferably be divided into two or more portions and the dosing tank so designed that the different portions of the systems may be thrown out of use and operated alternately, thereby allowing periods of rest without surcharging the remainder of the system. This could be done by having two or more main distributing lines extending diagonally from the outlet chamber of the dosing tank and having laterals extend from such main distributor nearly parallel with the contours of the ground. The closing of the inlet on one of the main distributors would then shut off the flow through the whole system of laterals tributary thereto. Both the main and lateral distributors should be laid with very slight slopes, and the dosing chamber should be so designed that each dose will nearly fill the portion or portions of the distributing system left in operation. Under the arrangement proposed by the plans, if one-half of the subsurface irrigation field were thrown out of use for the purpose of resting the field the other half of the field would be surcharged at each dose from the siphon chamber inasmuch as the volume of one dose is nearly equal to the capacity of the entire distributing system and if only one line of the distributing system were shut off at a time no adequate resting of the field would be provided for.

In conclusion I would state that it is found from our examination of the plans that although they have been designed in general to meet the local requirements for sewage disposal they are not in satisfactory condition for acceptance and should be modified in the following respects:

1. Manholes so designed as to facilitate the inspection and cleaning of the different tanks should be shown both on the plans and cross sections of such tanks.
2. A discharge siphon of standard make, designed to empty the dosing tank at each discharge should be provided for in the dosing tank.
3. A general location plan showing the disposal plant should show the entire subsurface irrigation system with dimensions, slopes and other details of the same.
4. The subsurface irrigation system and dosing tank should be so designed as to provide adequate means for properly resting different portions of the field at regular intervals.
5. The lines of lateral distributors in this case should not be more than, say, 200 feet in length.
6. The exact slope at which it is proposed to lay both the main and lateral distributors should be shown on the plan.
7. Detailed cross sections through both the main and lateral distributors showing methods of construction and manner of protecting the joints should be shown on the plans.

I would therefore recommend that the plans be returned for modification or additions in accordance with the above requirements.

ALBANY, N. Y., *September* 23, 1914

These plans were returned for revision on October 1, 1914.

Revised plans for sewage disposal for the Steuben Sanatorium were submitted for approval on October 23, 1914.

From our examination of the plans now presented it is found that they have been revised in general accordance with all the above requirements. It appears, however, that the area available for disposal and the topography at the disposal plant site are such that it would be impracticable to limit the length of the lines of lateral distributing pipes to 200 feet as recommended and at the same time provide sufficient tiling and cover a large enough area to properly care for the sewage of the institution.

It is therefore proposed to lay 14 lines of distribution tile 500 feet long each or a total of 7,000 feet of tiling which is twice the total length of tiling originally planned for. The area covered by the distributing system, however, is practically the same as shown by the plans first submitted.

The lines of tile comprising the distributing system are to be laid with open joints in trenches on a slope of 0.1 per cent. The tiles in the trenches are to be surrounded and covered with broken stone and, although not shown by the plans, the report of the designing engineers states that the joints of the tiles are to be covered with tar paper. The subsurface irrigation system is to be divided into two sections and the inlet chamber and piping are to be so arranged that either or both sections of the system may be operated at one time thereby providing means for resting either section as may be required. Each dose from the siphon chamber is sufficiently large to nearly fill one section of the field at each discharge of the dosing siphon.

In conclusion I would state that it appears from our examination of the plans that, except as noted, they have been revised in accordance with our recommendations and I am of the opinion that the proposed sewage disposal plant if properly constructed and operated should satisfactorily care for the sanitary sewage of the institution.

I would, therefore recommend that the plans be approved. It should not be necessary, however, to issue a permit in connection with the approval of the plans inasmuch as they do not provide for the direct discharge of sewage or sewage effluent into any stream or other body of water.

ALBANY, N. Y., *October* 27, 1914

HUDSON FALLS

Plans for proposed sewer extensions in the village of Hudson Falls were approved on May 21, 1914. A conditional permit was issued on the same date allowing the discharge into the Hudson river of sewage from the proposed sewer in Western avenue and Sarver street. The report on the examination of the plans and the conditions of the permit follow.

Plans for proposed sewer extensions in the village of Hudson Falls, Washington county were submitted to this Department for approval on April 20, 1914.

The records of this Department show that the plans for sewerage and sewage disposal of the village of Sandy Hill, now Hudson Falls, were approved by the then State Board of Health on June 30, 1896. These plans provided for a combined sewer system covering practically the entire village and for the treatment of the sewage from the greater portion of the village in the chemical precipitation plant to be located on the west side of the Hudson river a short distance below Baker's Falls Dam. Two overflows were provided for in this portion of the system, one near the abandoned bridge opposite Walnut street and the other at an island between Baker's Falls Dam and the disposal plant.

The sewers from the remaining portion of the village covering a comparatively small section in the southeastern portion of the village were shown tributary to a 20-inch outlet sewer which terminated near the southeastern corner of the village. According to the plans and the report of the Designing Engineer it appears that it was not proposed to construct this portion of the system at the first installation inasmuch as this section of the village was sparsely populated, containing less than forty families at that time, but that when this portion of the system was constructed the sewage would be disposed of by broad irrigation, intermittent sand filtration or both.

Although the report referred to states that in the flat portions of the village where the street grades were insufficient to convey the storm waters in the gutters it was proposed to use a combined system, and that all other portions of the system were designed to take house sewage, the entire system is essentially a combined system inasmuch as catch basins are shown on practically all portions of the system. This report also points out that the sewers comprising the system would be too small to carry storm water after the streets were paved and the village becomes built up and suggests that if it becomes necessary to treat the sewage the storm water may be entirely excluded from the sewers in sections 1 and 2 which comprise the greater portion of the village and storm sewers constructed to care for the surface water.

Plans for a modification of the original system providing for extensions in newly developed sections and for enlargements of the main trunk and outfall sewers were approved on Jan. 30, 1901. These plans also provided for two overflows for the main system, one near the abandoned bridge opposite Walnut street, as in the case of the original plans, and the second near the middle of the river just below Baker's Falls Dam. Otherwise the sewerage and sewage disposal systems were practically the same as originally planned.

On Dec. 4, 1913, a proposition to construct sewers in Western avenue and Sarver street in the village was approved under and in accordance with section 21-a of the Public Health Law. The village attorney was advised at the time of the approval of these plans that it would be necessary under the requirements of the Public Health Law to submit plans for the proposed extensions.

The plans now before the Department and under consideration were submitted in accordance with the above requirements and show that it is proposed to construct comparatively short sewer extensions in Western avenue and Sarver street. The proposed sewer in Western avenue is to be an

8-inch sewer with a slope of .08 per cent. and is to extend southerly from the existing manhole in this street for a distance of about 275 feet. The sewer in Sarver street is to be 6 inches in diameter with a slope of 1 per cent. and is to extend from Western avenue to Main street, a distance of 300 feet.

Both of the sewers are to be tributary to the existing sewers in Melbourne avenue which forms a part of the main sewer system discharging into the Hudson river. It is found from our careful examination of the plans that the proposed sewers if properly constructed should be adequate as to size and capacity to care for the sanitary sewage of the sections to be served by them.

Although the construction of these sewers may not materially increase the pollution of the Hudson river at this point, it has been the consistent policy of the Department to remove as far as practicable the gross pollution of the river caused by the discharge of untreated sewage from the municipalities along the stream. I am of the opinion, therefore, that steps should be taken at an early date by the officials of Hudson Falls to have made a careful study of the sewerage conditions of the village with a view of determining the most appropriate means of collecting and disposing of the entire sanitary sewage or dry weather flow of the village and that plans for the interception or collection and treatment of such sewage should be submitted to this Department for approval.

Careful consideration should be given at this time to the practicability of removing the storm water from the existing sewers and constructing storm water sewers as suggested by the engineer who prepared the original plans. Owing to the small sizes of the sewers comprising the existing sewer systems, if constructed in accordance with the approved plans, portions if not all of the system are in all probability already overtaxed during times of storm and should be relieved by the construction of a storm water system. Such separation of the storm water from sanitary sewage must necessarily be made before the installation of treatment works. If, however, it is found that the complete separation of the sewage from the storm water could not be effected with reasonable economy it might be found proper at this time to remove as much of the storm water as practicable and provide for the interception of the dry weather flow of sewage and its conveyance to a suitable point or points for treatment. In either case, the construction of sewers on the combined plan should be discontinued.

Although the site for the proposed sewage disposal plant as shown by the original drawings may be favorably located with reference to the developed portions of the village, I believe that an attempt should be made to locate the plant on the east side of the river where it would be more accessible. I am of the opinion, also that a more modern and appropriate method of treatment than by chemical precipitation should be adopted inasmuch as the degree of purification effected by this method is not commensurate with the cost of installation and operation of such system and that sedimentation or Imhoff tank treatment would in all probability provide for a more suitable method of preliminary treatment. Any plans for sewage disposal submitted should embody detail plans for the separation or interception of the sewage of this village together with detail plans for the preliminary treatment of the sewage by sedimentation and general plans for supplementary or more complete treatment of such sewage.

In view of the above, I would recommend that the plans for the proposed sewer extensions be approved and a permit be issued allowing the discharge of sewage from the proposed sewers into the Hudson river on the condition that detailed plans for the separation or interception of the entire sewage of the village and detailed plans for preliminary treatment of such sewage together with general plans for more complete treatment be submitted to this Department for approval on or before February 1, 1915.

ALBANY, N. Y., *May* 7, 1914

PERMIT

A permit containing the following conditions, was issued in connection with the approval of the plans on May 29, 1914.

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary.

2. That the issuance of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.

3. That only sanitary or domestic sewage, and no storm water or surface water from streets, roofs or other areas shall be admitted to the proposed sewers.

4. That on or before February 1, 1915, the village of Hudson Falls shall submit to this Department for approval, satisfactory detailed plans showing a comprehensive system of intercepting and outfall sewers to convey to a suitable site or sites for sewage disposal works the entire sanitary sewage of the village of Hudson Falls collected by separate sanitary sewers and the entire dry weather flow of sanitary sewage of said village collected by combined sewers, together with detailed plans showing works for partial treatment or clarification of such sewage and general plans for additional works for more complete treatment of sewage.

5. That upon approval of said plans and when required by the State Commissioner of Health such intercepting and outfall sewers and such works for sewage disposal shall be constructed and put in operation within the time limit which may be then specified.

KENMORE

Plans for sewerage and sewage disposal for the village of Kenmore were submitted for approval on December 8, 1914, and after an examination of them were returned for modifications on December 12, 1914. Plans revised in accordance with the requirements of this Department were resubmitted for approval on December 24, 1914, and were approved on December 30, 1914. The reports on the examination of the plans and the conditions of the permit issued in connection with the approval of them follow.

Plans for proposed sewers and sewage disposal works for the village of Kenmore, Erie county, were submitted to this Department for approval by the board of trustees on December 8, 1914.

The records of the Department show that plans for sewerage for the village of Kenmore tributary to the Buffalo sewer system were approved by this Department on April 3, 1907. Plans for a sewer extension in McKinley avenue were approved on October 24, 1913, and a permit was issued allowing the discharge of sewage from the proposed sewer extension through the Buffalo sewer system into the Niagara river.

The sewer system of the village of Kenmore, under agreement with the city of Buffalo made by authority of an act of the Legislature, discharges into the Hertel avenue sewer of the Buffalo sewer system. Subsequent to complaints received by this Department in the early part of 1913 regarding the discharge of storm water into the sanitary sewers which was in violation of the conditions of approval of the plans, the surface water inlets into these sewers were closed.

In a recent conference with the engineer of the village in this office when the question of disposal of the sewage of the village was taken up, two methods other than the use of the Buffalo sewers for the discharge of the sewage of Kenmore were suggested, namely:

1. To provide complete treatment including filtration and discharge of the effluent into a nearby watercourse.
2. To provide some form of preliminary treatment and discharge of the effluent into the Niagara river.

The plans now submitted were prepared by White and Getman, civil engineers of Buffalo, and comprise blue prints and tracings of the following sheets:

1. General plan of sewerage system
2. Plan of outfall sewer and siphon under Erie canal
3. Sewer appurtenances
4. Eight sheets of sewer profiles

The report of the engineer states that it is proposed to discontinue the discharge of sewage into the sewerage system of the city of Buffalo and to convey the sewage through a trunk line to the Niagara river into which it is to be discharged after treatment in a screening chamber. The only construction contemplated by the village at the present time is the main trunk line from Delaware and Kenmore avenues to the Niagara boulevard. All storm water is to be excluded from the sanitary sewers and it is proposed by an arrangement with the city of Buffalo to discharge this storm water into the city system.

The village of Kenmore is situated north of and adjacent to the city of Buffalo. It is provided with an unfiltered water supply taken from Lake Erie and the works are controlled by the Western New York Water Company. The village is provided with public sewers serving about one third of the village and discharging into the sewers of the city of Buffalo at Hertel avenue.

The present population of the village according to the engineer's report is approximately 1600 and its area 525 acres giving a density of about 3 per acre. The increase in the population of the village has been rapid showing an increase of 220 per cent from [illegible] to [illegible]. The designing engineers have designed the outfall sewer with sufficient capacity to care for the sewage from 40,000 persons.

The plans have been carefully examined with respect to both sewerage systems and sewage disposal works. In connection with the sewerage system the design has been carefully studied with reference to alignment, sizes, grades, capacities, facilities for cleaning and inspection and other features of a hydraulic or sanitary nature. In connection with the works for sewage disposal it has been studied with reference to general method and efficiency of the sewage disposal plant as a whole.

The proposed sewers vary in size from [illegible] inches to [illegible] inches in diameter and cover nearly all of the streets shown. They are apparently of sufficient capacity to meet the probable future needs of the village and are to be laid on slopes sufficiently steep to provide [illegible] and prevent clogging if the sewers are properly constructed and maintained. The sizes and slopes of some of the present sewers in such streets as Prospect avenue, Somerton avenue and [illegible] avenue are not shown on the plans and are marked on the profiles as being existing. The alignments of all proposed sewers are straight between manholes and manholes have been placed at every change of slope.

The maximum spacing between manholes is approximately [illegible] feet on the proposed sewers but on the sewers already constructed the spacing is frequently more than [illegible] feet. Although it is possible that these present sewers have been operating successfully it may be necessary to provide manholes at more frequent intervals in order that provision may be made for future inspection, [illegible] and [illegible] of these sewers.

The sewage of the village is to be concentrated at the corner of Military road and Shepard avenue in the village where it enters a [illegible] inch trunk sewer which passes north along Military road [illegible] passes in a westerly direction to a proposed screening chamber which is located in Ensminger road in the town of Tonawanda about 1300 feet east of Two Mile Creek road and about midway between the village of Kenmore and the Niagara river into which the effluent is to be discharged.

The screening chamber through which the sewage is to be passed is shown by the plans as located close to the southerly side of the Ensminger road. Although the screening chamber is to be covered with a concrete roof, its location in the road will make it difficult of access, because of the difficulty of entering the chamber, of lighting it and of raking the screens and removing the screenings. No manhole is shown by the plans in the roof of the screening chamber although some such means of entrance must necessarily be provided. It is possible that an opening in the side wall of the screen chamber shown by the plans is intended to represent a door giving entrance to the chamber. The screening chamber should be located away from the highway on the disposal plant site which will be occupied by the disposal works when complete, in the relative position which it will then occupy. It should be covered by an appropriate building, easy of access, well lighted and arranged to allow convenient removal of the screenings. If this is not done it must necessarily be anticipated that the screens will be allowed to clog and that the sewage will flow over them without the removal of any of the solids.

The screen is to be 5 feet wide and is evidently to consist of 7-foot bars spaced about 2 inches on centers although this spacing is not designated on the plans.

I am of the opinion that in order to facilitate cleaning the screens should be installed in duplicate and that the inlet and outlet of the screening chamber should be so arranged that either one or both of such duplicate screens may be operated at one time. The intermediate rods and spacers holding the bars of the screen in proper position should either be removed or so placed as not to interfere with the raking of the screens. Furthermore, the ends of the bars should be curved and should extend to a point above the elevation of the crown of the inlet sewer.

A site is indicated on the plans near the point at which the screening chamber is shown on which additional works for the treatment of the sewage may be located when they become necessary. A drop of 9 feet has been provided in the sewer at this point to give hydraulic head for the operation of such disposal plant.

The sewage after being screened passes through a 30-inch outfall sewer which runs parallel to Two Mile creek to the Niagara river. This outfall sewer passes under the New York Central and Hudson River railroad tracks, a small arm of Two Mile creek and the Erie canal. For the section of the outfall sewer crossing under the railroad it is proposed to use cast iron pipe. A necessary precaution has also been incorporated into the specifications for all sections of the sewer to be laid in wet ground.

The outfall sewer enters a specially constructed manhole on the south bank of the Erie canal from which a 24-inch cast-iron pipe, to be surrounded by concrete, conveys the sewage under the canal to the Niagara river. The outlet is to be protected by a concrete head backed by stone on the bank of the river.

In view of the results of our examination of these plans and after careful consideration of the essential features of the design and of local and general requirements with respect to proper methods for the disposal of sewage from the proposed system of sewers and screening chamber I beg to recommend that these plans be returned for modification in accordance with the following recommendations:

1 That the proposed site of the screening chamber be changed from the Ensminger road to the location entirely outside the highway which it will occupy on the disposal plant site as shown by the plans when more complete disposal works are required.

2 That the screening chamber be covered by a building easy of access, well lighted and sufficiently large to allow of convenient removal of the screenings.

3 That the screens be shown in duplicate and that dimensions of bars and mesh be indicated and that the screens be so arranged that either one or both of them may be operated at one time and that the elevation of the top of the screens be well above the arch of the inlet sewer.

ALBANY, N. Y., *December* 11, 1914

Revised plans for sewerage and sewage disposal for the village of Kenmore, Erie county, were submitted to this Department for approval by the Board of Trustees on December 24, 1914.

It is found from our examination of the plans now presented that they have been revised in accordance with all of the above requirements and show that the proposed screen chamber is now to be located near the northeastern corner of the sewage disposal site with the nearest point of the chamber about 10 feet south of Ensminger road.

The screen chamber is to be covered with a concrete building 28′ x 17′ in plan inside dimensions. The building is to be provided with two louvered ventilators having wire glass skylights protected by heavy mesh wire screens. It would appear, therefore, that the proposed arrangement should provide adequate ventilation and lighting for the screen chambers. The building is also to be provided with double doors.

The proposed screens are to be installed in duplicate and a rectangular wooden gate is to be placed at the head of each screen channel so as to permit of operating either or both screens at one time. A shallow grit pocket is shown beneath each screen and the screens are to be constructed in two sections for the purpose of facilitating raising the screens when the grit chambers are to be cleaned. A chain hoist is also to be installed for lifting the screens and the gates of the chamber. Each screen is to be five feet wide and is to be composed of 3/16″ x 3″ x 10″ bars spaced 1 and 1/16″ in the clear. The upper ends of the screens are shown extending well above the arch of the inlet sewer.

Although no area appears to have been set aside for the disposal of the screenings and grit removed from the screen chamber there seems to be sufficient area available in the disposal plant site to permit of properly disposing of these materials by burying or plowing them under. Owing to the close proximity of the disposal plant to the highway, special precautions should be taken to properly operate the plant and dispose of the screenings in order that objectionable conditions may not be created by its operation. I believe, therefore, that a man should be detailed to operate and care for the plant and that he should be held responsible for its proper maintenance.

In conclusion I would state that it appears from our examination of the plans that they have been revised in accordance with the recommendations of this Department and that the proposed sewers and sewage disposal plant if properly constructed and maintained, should satisfactorily care for the sanitary sewage of the village.

I would, therefore, recommend that the plans be approved and a permit be issued allowing the discharge into the Niagara river within the city of Tonawanda, of effluent from the proposed screen chamber, upon the condition that whenever required by the State Commissioner of Health, detailed plans satisfactory to this Department, for supplementary or more complete treatment of the sewage of the village, shall be submitted for approval; and that after the approval of such plans any or all portions of such supplementary works for more complete treatment of the sewage of the village shall be constructed and put in operation at such time or times thereafter as said Commissioner may designate.

ALBANY, N. Y., *December* 29, 1914

PERMIT

The permit issued in connection with the approval of these plans on December 30, 1914, contains the following conditions:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary.
2. That the issuance of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.
3. That both the sewer extensions and the sewage disposal works shown by plans approved this day shall be fully constructed in complete conformity with such plans or approved amendments thereof.
4. That only sanitary or domestic sewage and no storm water or surface water from streets, roofs or other areas shall be admitted to the proposed sewers or sewage disposal works.
5. That whenever required by the State Commissioner of Health detailed plans, satisfactory to this Department, for additional or supplementary works for more complete treatment of the sewage of the village shall be submitted for approval; and that after approval of such plans any or all portions of such additional or supplementary works for more complete treatment of the sewage of the village shall be constructed and put in operation at such time or times thereafter as said commissioner may designate.

LANSING (Cayuga Preventorium)

Plans for a sewage disposal plant, consisting of a settling tank and subsurface irrigation system, for the Cayuga Preventorium in the town of Lansing, Tompkins county, were approved on November 2, 1914. The population to be cared for consists of two adults and from 6 to 10 children.

LYONS

General plans for modifications of plans for sewerage and sewage disposal formerly approved by the Department were submitted for approval on February 13, 1914. These plans, however, were not in satisfactory shape for acceptance and were therefore returned for revision on February 16, 1914. Plans revised in general accordance with the recommendations of this Department comprising amended plans for a sewer system and for a sewage disposal plant consisting of screen and grit chambers, pumping station, settling tank of the Imhoff type and sprinkling filter were resubmitted on May 4, 1914, and were approved on May 21, 1914. On the same date a proposition to temporarily omit from construction certain portions of the permanent general sewer system were approved. On July 23, 1914, amended plans for sewage disposal for the city were submitted as required by the permit issued on May 21, but inasmuch as they were not in satisfactory condition for approval they were returned for modifications. The plans, after having been revised, were resubmitted on August 15, 1914, and approved on August 20, 1914. Reports on the examination of the plans and the conditions of the permits issued follow.

Plans for sewer construction in the village of Lyons, Wayne county, were submitted for your approval by the village president on behalf of the village authorities on February 13, 1914.

These plans, which consist of a single white print showing by red lines the sewers it is proposed to construct, but showing no details of the design of these sewers or the location of the outfall or the proposed sewage disposal works, were submitted to accompany an application from the village authorities for an order from you covering the following:

1. Approval of the plans for sewerage and sewage disposal for the village of Lyons prepared by Alexander Potter, civil engineer, and approved by the State Board of Health on June 29, 1897, amended as follows:

(a) By a change in location of the outfall sewer

(b) By a change in location and design of the sewage disposal works

(c) By the addition of proposed additional sewers in Mirick place and other streets not shown by the original plans referred to above and amounting to 2,940 lineal feet

2. Approval of a proposition to temporarily omit or defer a portion of the permanent general sewer system of the village as provided for by section 260 of the Village Law, the sewers to be omitted being shown on the original plans referred to above in a road near Hill street and in other streets and amounting to 23,390 lineal feet.

It is requested by the village authorities that action be taken by you on the application described above without requiring the submission of detailed plans showing the proposed additional sewers and before plans are submitted showing the amended plans for sewage disposal, it being stated that "detail plans and specifications for said disposal plant will be hereafter submitted for approval" although no reference is made to the subsequent submission of detail plans for the proposed additional sewers.

After a careful consideration of the matters presented for your approval in the order given above it may be stated that:

1. The plan for sewer construction presented does not give sufficient data with reference to the proposed additional sewers to enable this Department to reach any final decision as to the propriety of approving the plans for these sewers and in fact merely indicates the location of such additional sewers. It was suggested in your communication of January 30, addressed to the village attorney, that the engineers employed by the village be asked to prepare, for submission to this Department for approval, comprehensive plans covering the entire village showing all sewer routes and such information as is called for by the rules and regulations of the Department governing the submission of plans for systems of sewerage and sewage disposal.

2. The application for approval of the proposition to temporarily omit or defer the construction of a portion of the permanent general system of sewers for the village may possibly be considered separately from the matter of approval of plans for additional sewers or changes in the location and design of the disposal works if desired by the village authorities but it would seem desirable that this application be acted upon at the time of or immediately subsequent to the approval of a new plan for sewers showing the proposed additional sewers and that nothing would be gained by earlier action thereon.

In conclusion, it is my opinion that before action is taken on the application of the village authorities a plan should be submitted for approval showing the entire sewer system to be constructed at present. The sewers it is proposed to temporarily omit should also be shown on this plan, possibly by dotted lines. The submission of detailed plans showing the proposed changes in location of the outlet sewer and a revised design for the disposal works would not be necessary at this time provided the general or tentative location of the outlet sewer be shown on this plan together with an outline plan of the proposed disposal works.

This plan, if satisfactorily meeting the requirements of the Department, might then be approved on condition that the sewer system and sewage disposal works be not constructed until satisfactory detailed plans of the outlet sewer and sewage disposal works are submitted to and approved by this Department. At that time approval of the proposition to temporarily omit or defer the construction of the sewers named in the application might be given.

I would accordingly recommend that the plans be returned to the village authorities accompanied by a copy of this report and that they be advised that the application presented will be acted upon when plans are presented in accordance with the above suggestions.

ALBANY, N. Y., *February* 16, 1914

Amended plans for sewerage and sewage disposal for the village of Lyons were resubmitted to this Department for approval by the board of trustees on May 4, 1914.

These plans, showing in general proposed modifications of plans formerly approved, were previously submitted on February 13, 1914. These plans, however, were not in satisfactory shape for acceptance and were therefore returned for modification on February 16, 1914.

The records of the Department show that original plans for sewerage and sewage disposal of the village were approved on June 29, 1897. These plans provided for a comprehensive sanitary sewer system covering practically all the developed portions of the village in which streets were shown and for a sewage disposal plant consisting of intermittent sand filters and broad irrigation fields to be located near the easterly bank of the Clyde river in the southeastern part of the village.

The plans now submitted were prepared by J. F. Witmer Company, engineers of Buffalo, and comprise duplicate prints of the following sheets:

1 General map of the village showing the proposed sewerage and sewage disposal systems

2 Three sheets of profiles showing profiles of proposed new sewers and changes of alignment of original sewers

3 Six sheets showing plans and details of sewage disposal plant

4 One sheet showing details of injector station

5 United States geological survey map showing territory to be served by proposed sewerage system.

A copy of the report of the designing engineers covering the proposed changes and modifications together with duplicate copies of specifications was also received.

The report of the engineers states that the present development of the village is such as not to require sewers in certain outlying sections and that there are certain newly developed streets which require sewers, not provided for by the original plans. It is, therefore, proposed to omit for the present the construction of about 24,000 feet of sewers shown by the original plans and to construct about 3,000 feet of sewers in addition to those shown on the plans originally approved. The sewers to be omitted are shown on the plans by dotted blue lines, the proposed new sewers by solid black lines and the sewers to be constructed in accordance with the plans of the original system by solid blue lines. The sewers to be reconstructed owing to the proposed change of location of the disposal plant are shown in red.

The report also states that owing to the construction of the Barge canal through the village it has been found necessary to change the location of the proposed sewage disposal plant. This change requires the reconstruction of the sewers in Montezuma street and in Geneva, Franklin and other streets in that portion of the village south of the Clyde river known as the railroad district. It is pointed out that the proposed changes will permit of constructing certain of these sewers with steeper slopes than originally planned and will also obviate the necessity of constructing two inverted siphons, one across the Barge canal, the other under the Clyde river. The proposed changes, however, necessitate pumping the sewage from the southern part of the village across the Barge canal.

The village of Lyons is situated in the southwestern part of the town of the same name on the Clyde river. It is provided with a public water supply taken from Mud creek near the western part of the village and the water works are controlled by the Lyons Water Works Company. It appears, however, that the village has recently voted to purchase the property of the

Lyons Water Works Company and to obtain a new supply from ponds forming the head waters of Pond brook in the town of Junius about seven miles south of the village.

The present population of the village according to the 1910 census is approximately 4,500 and the area of the village is about 2,500 acres, giving an average density over the entire area of about two persons per acre. Less than one-half the area of the village is built up at present. The remaining portions appear to be flat low lands largely occupied by streams, canals and railroads and it is not probable that the present developed sections of the village will be extended greatly in the future. Based on an estimated ultimate density of population of six persons per acre, it is assumed that the population ultimately to contribute sewage to the sewer system will be approximately 15,000, which is about three times the present population.

The portions of the sewer system to be constructed in the near future will contain about 13½ miles of sewers ranging in size from 6 to 18 inches in diameter. The proposed new sewers in Merrick place, cross and other streets not shown by the original plans are to be 8-inch sewers and are to be constructed with slopes sufficiently steep to give self-cleansing velocities in them and to prevent clogging under ordinary conditions. The sizes and capacities of the outfall sewers are to be the same as provided for by the original plans and the sewers, if properly constructed so as to prevent excessive infiltrations of ground water, should satisfactorily care for the probable future population to be tributary to them. It will be necessary, however, to construct the outfall sewers which appear to run through low, wet areas with as tight joints as possible in order to keep out ground water.

As noted above, the sewage from the portion of the village south of the Clyde river is to be pumped across the river at Geneva street from an injector station to be located south of the Geneva street bridge. This station is to be entirely underground and is to contain 2 pneumatic injectors having a capacity of 150 gallons per minute each and will therefore be able to handle a flow of 432,000 gallons per day, which will probably not be exceeded for a number of years. The air compressors, which are to be operated by electric motors, are also in duplicate. The force main from the injector station is to be carried across the river on the bridge at Geneva street, from which it will flow by gravity to the proposed sewage disposal plant.

It is proposed to treat the entire sanitary sewage of the village in a sewage disposal plant consisting of an Imhoff tank, sprinkling filter and sludge bed, to be located near the intersection of Black brook with the Erie canal. This brook discharges into the Clyde river about 1,000 feet below the disposal plant. Black brook at this point has a drainage area of about 3 square miles. The Clyde river, which is being canalized to form the Barge canal, has a drainage at Black brook of about 730 square miles. The Clyde is a tributary to the Seneca river and has upon it a fairly large urban and rural population. It is not used for public water supply purposes below the sewage disposal plant.

Although the site of the disposal plant is only about 600 feet from Montezuma street, the report of the designing engineers states that the location is very desirable inasmuch as it cannot be seen from the adjacent roadway. The report also states that the pumping station and the Imhoff tanks are to be placed above maximum high water which is at elevation 405 and that the sprinkling filter at times of high water, before the completion of the Barge canal, will be covered with water, the top of the sprinkling filter being at elevation 402.

It is found, however, from the data secured from the Barge canal office at Albany that the normal level of the Barge canal near the disposal plant will be at elevation 386 and that the maximum high water mark of the canal provided for will be at elevation 391.7. The highest recorded water level of the Clyde at Lyons since the gauging station was installed at this point in 1905 is 400.8 and a high water stage greater than 400 has been reached only eight times for intervals of from 1 to 4 days since 1906. It appears therefore that provided the datum used on the Barge canal and by the designing engineers for the disposal plant is the same, which appears from the plans to be the case, the elevations of the bottom of the filter, which vary from 394 to 398, will be from 2 to 4 feet above the maximum high water mark of the Barge canal after it is completed and that only occasionally will the operation of the sprinkling filter be interfered with before that time.

It was learned from the Barge canal authorities that the contract above the village to the point where Black brook enters the Barge canal has been completed and that contract below this point is partially completed, but that work on this lower section has been suspended and will not be taken up again until the contract is relet. It is estimated that this portion of the canal will be completed within two years.

The sewage upon reaching the disposal plant will be passed through a screen and grit chamber. The screen chamber is about 4½ feet wide and is to be provided with an inclined bar screen. No details of this screen are given either on the plans or specifications. It may be stated that the clear openings between the adjacent bars composing the screen should not be less than one inch in order to prevent frequent clogging of the screen and keep down the cost of maintenance and operation of the pumping station.

After passing through the screen the sewage may be passed through either of two grit channels, each of which is 21 inches wide and 30 inches deep. After passing through the grit channels the sewage may be passed into either or both of two pump wells at the pumping station. According to the report of the designing engineers the grit channels are provided in order to remove sand and grit which might injure the pumps. I am of the opinion, however, that it should not be necessary to provide grit chambers or channels at the pumping plant, designed to handle sanitary sewage only, as there is very little, if any, grit in sanitary sewage which does not receive surface wash. Each of the pump wells at the pumping station is 10½ feet wide by 13 feet long with an average depth of about 3½ feet below the inlet channels, giving a capacity of about 3,600 gallons. The combined capacity of the pump wells is equal to an average flow of about 20 minutes with a sewage contribution of 500,000 gallons per day.

An electrically operated centrifugal pump having a capacity of 735 gallons per minute or about 1,000,000 gallons per day is to be placed in each of the sumps or pump wells. It appears, therefore, that although the pumping capacity of the station is equal to about four times the average flow of sewage, no provisions are made by the plans to provide against a failure in the supply of the electric current. I would strongly recommend that in order to prevent the interruption of the operation of the pumping station either an auxiliary engine and electric generator to furnish electricity in case of emergency or an additional independent engine and pump in addition to the pumping equipment shown on the plans be provided for.

From the pumping station the sewage is to be pumped against a static head of about 26 feet into an Imhoff tank comprising the preliminary treatment portion of the sewage disposal works. Piping from the pumping station to the settling tank and the inlet and outlet channels of the tank are so arranged as to permit of reversing the flow of sewage through the tank.

The settling tank which is to be of the longitudinal flow type is to be 67 feet x 20½ feet x 31 feet deep, inside dimensions with a depth below the flow line of 29 feet, 6 inches. It is to be divided by means of concrete partition walls into two upper or settling compartments, 11 feet, 6 inches deep and about 8 feet wide inside dimensions and into three lower hopper-shaped compartments for the storage and digestion of sludge. The settling compartments have a capacity of about 72,000 gallons and will give an average detention of the sewage of about 3½ hours when serving a population of 5000 which is somewhat in excess of the present population.

The sludge compartments have sufficient capacity to provide for the storage of sludge deposited from the sewage contributed by 5000 persons for a period of about six months. The sludge is to be removed by means of 8-inch sludge pipes and discharged by gravity flow to an adjacent sludge drying bed under a static head of about 9 feet. A 1-inch perforated water pipe is to be located near the bottom of each sludge hopper in order to facilitate the removal of sludge.

The proposed sludge bed is to be constructed with concrete sides and is to cover an area of 2,250 square feet. The underdrain system of the bed is to consist of two main 8-inch drains and 3-inch laterals spaced 7 feet, 6 inches apart. The filtering material above the underdrain system according to the plans is to consist of 24 inches of sand and gravel. According to the specifications, however, it is to consist of 12 inches of graded gravel and broken stone arranged as follows from the bottom up: a 5-inch layer, ranging in size from 2½ inches to 1 inch; a 5-inch layer, ¾ to ¼ inch; a 2-inch layer, ¼ inch to 1/16 inch; a top layer of coarse mortar sand, ½ inch deep. I am of the opinion that the proposed sludge bed if constructed as specified should satisfactorily care for the sludge from the proposed settling tank.

From the settling tank the clarified effluent may be discharged either to a dosing tank or by-passed directly to Black brook. It should, however, not be necessary to provide by-pass around the sprinkling filter and the by-pass, in accordance with the general requirements of this Department and especially because of the small size of the brook into which the effluent is to be discharged, should be omitted.

The proposed dosing tank which is to be located at the head of the operating gallery of the sprinkling filter is to be hopper-shaped and will contain a 12-inch automatic discharge siphon of the Miller type. The capacity of the siphon chamber is such as to give a discharge of the siphon about once every ten minutes, when treating an average of 500,000 gallons per day. From the dosing tank the sewage is to be discharged into the distributing system of the proposed sprinkling filter under a maximum static head of 5.5 feet. Provisions are made by the plans for the future construction of an additional filter to be operated from the same dosing chamber.

The sprinkling filter is to be constructed with concrete sides and bottom. In the side walls of the filter, which is to be above ground, are to be inserted 6-inch x 12-inch, 2 chamber vitrified building tile spaced 18 inches apart from center to center. The filter is to be filled to a depth of from 6 to 6½ feet, with broken stone ranging in size from 2½ to 1½ inches. The underdrain system is to consist of a false floor of 6-inch vitrified, split pipe discharging into four 15-inch semicircular lateral drains which in turn connect with a 24-inch main drain by means of which the sewage is to be discharged directly into Black brook near the disposal plant without any additional treatment.

The distributing system is to consist of a 20-inch main, 6-inch laterals and 3-inch risers with nozzles spaced 13 feet apart from center to center. I am of the opinion that in view of the comparatively small operating head provided for, the proposed spacing of the nozzles is too great to give a uniform distribution of the sewage over the entire area of the sprinkling filter and that either the head on the nozzles should be materially increased or the spacing of the nozzles decreased. In general it has been found in practice that the radial reach of the spray is but slightly greater than the head on the nozzles.

The proposed filter is to be 107 feet long by 85 feet wide giving an area of .21 acres. According to the plans and the report of the designing engineers the proposed filter will be required to operate at the rate of 2,200,000 gallons per acre per day when serving the present population on the usual assumptions as to sewage contribution. It is proposed to construct the additional filter shown in general by the plans when the rate of operation of the first unit exceeds 3,000,000 gallons per acre per day.

The proposed rate of operation, however, is too high to insure satisfactory results for the depth of filter shown. I am of the opinion that the rate of filters should not exceed 1,800,000 gallons per acre per day which would require increasing the area of the proposed filter to one quarter of an acre to serve the present population of 4,500 persons. The second unit of the filter should be constructed when the population tributary to the first unit exceeds the present population of the village.

As noted above, it is proposed to discharge the filtered effluent directly into Black brook without any additional treatment. It is usual to pass the effluent from the sprinkling filters through short period detention settling tanks before discharging it into the stream in order to remove solids which are periodically given off by filters of this type. Owing to the small size of the streams it may become necessary to construct a final settling tank and also to extend the effluent pipe to the Barge canal.

In conclusion I would state that it appears from our examination of the plans that the proposed sewerage and sewage disposal systems have been designed in general to meet the local requirements for sewerage and sewage disposal. There are however, certain modifications which should be made in the design of the sewage disposal plant and certain details which should be furnished before the plant is constructed and plans showing such modifications and details should be submitted for approval prior to the construction of the plant.

I would therefore recommend that the plans for sewerage and sewage disposal be approved and a permit issued allowing the discharge into Black brook of effluent from the proposed sewage disposal plant and that the permit contain in addition to the usual revocation and modification clauses the condition that before the construction of the pumping station and sewage disposal plant, plans satisfactory to this Department, showing the following details and modifications shall be submitted for approval:

1. Plans showing details of screens in the pumping station designed with bars having clear openings between adjacent bars of not less than one inch
2. Plans showing auxiliary pumping or power equipment at the pumping station.
3. Plans showing no by-pass for any portion of the disposal plant
4. Plans of the first unit of the sprinkling filter having an area of not less than .25 acres
5. Plans providing for a greater operating head of the sprinkling filter or for a smaller spacing of the spray nozzles of the filter

I would also recommend that the permit contain the provision that, when required by the State Commissioner of Health, either the effluent pipe from the sprinkling filter shall be extended to the Clyde river or Barge canal or a final settling tank shall be installed to treat the effluent from the filters before its discharge or that both of these modifications shall be made in accordance with plans satisfactory to this Department.

ALBANY, N. Y., *May* 16, 1914

PERMIT

The permit issued in connection with the approval of the plans on May 21, 1914, contains the following conditions:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary.
2. That the issuance of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.
3. That both the sewer system and the sewage disposal works shown by plans approved this day shall be fully constructed in complete conformity with such plans or approved amendments thereof except as provided in Condition 6 of this permit.
4. That only sanitary or domestic sewage and no storm water or surface water from streets, roofs or other areas shall be admitted to the proposed sewers or sewage disposal works.
5. That no sewage sludge from any part of the disposal works shall be discharged into Black brook, Clyde river or any other watercourse or body of water.
6. That before any portion of the sewer system or sewage disposal works shall be constructed satisfactory plans shall be submitted to this

Department for approval showing the following details and providing for the following modifications in the plans for the pumping station and sewage disposal works:

(*a*) Plans showing details of screens in the pumping station designed with bars spaced one inch apart in the clear.

(*b*) Plans showing auxiliary pumping or power equipment at the pumping station in addition to and independent of that shown on the present plans and sufficient to care for the probable flow of sewage.

(*c*) Plans showing no by-passes for any portion of the sewage disposal works.

(*d*) Plans for the first unit of the sprinkling filter showing an area of not less than 0.25 of an acre.

(*e*) Plans providing for a greater operating head on the sprinkling filter and for smaller spacing of the spray nozzles of the filter.

7. That the pumping station and sewage disposal works shall be constructed in accordance with such modifications of the plans.

8. That whenever required by the State Commissioner of Health either the effluent pipe shall be extended to the Clyde river or Barge Canal or a final settling tank shall be installed to treat the effluent from the filters before it is discharged or that both of these changes in the sewage disposal works shall be made in accordance with plans satisfactory to this Department.

On May 21, 1914, approval given for the temporary omission from construction of the following portions of the general sewer system:

Road near Hill street from Maple street west; Hill street west from Phelps street; Cherry street east of Hotchkiss lane; Hotchkiss lane from point 700 feet northwest of Queen street; Canal street northeast from Jackson street; Layton street north from point 2,400 feet from Newark road; Newark road west of Mud creek; Whitney's lane from Newark road north; Blue-cut road from point 450 feet from Leach road; Leach road south from point 400 feet south of Blue-cut road; Geneva street from a point 1,000 feet south of West Shore railroad; Montezuma street east of Black creek; Summit street north end.

Amended plans for sewage disposal for the village of Lyons were submitted to this Department for approval by the village attorney on behalf of the board of trustees on July 23, 1914. As noted above, amended plans for sewerage and sewage disposal for the village of Lyons were approved by this Department on May 21, 1914. The permit issued in connection with the approval of these plans contains in addition to the usual revocation and modification clauses the following conditions:

1. That before any portion of the sewer system or sewage disposal works shall be constructed satisfactory plans shall be submitted to this Department for approval showing the following details and providing for the following modifications in the plans for the pumping station and sewage disposal works:

(*a*) Plans showing details of screens in the pumping station designed with bars spaced one inch apart in the clear

(*b*) Plans showing auxiliary pumping or power equipment at the pumping station in addition to and independent of that shown on the present plans and sufficient to care for the probable flow of sewage

(*c*) Plans showing no by-passes for any portion of the sewage disposal works

(*d*) Plans for the first unit of the sprinkling filter showing an area of not less than 0.25 of an acre

(*e*) Plans providing for a greater operating head on the sprinkling filter and for smaller spacing of the spray nozzles of the filter.

The plans now under consideration were submitted in compliance with the above requirements and show that they have been revised in general accordance with all except condition (*b*) of these requirements. A note on the plans of the pumping station states that the screen is to be constructed of ¾" x 2" bars spaced 1¾" center to center; the outlet pipe from the settling tank to the effluent pipe from the sprinkling filter shown by the original plans by-passing the filter has been omitted; the first unit of the sprinkling filter as well as the unit to be constructed in the future has been increased from 1/5 of an acre to about ⅙ of an acre in area, the depth of the filter remaining the same; and the spacing of the spray nozzles of the filter has been decreased from 13 feet to 11 feet center to center, the head on the nozzles is presumably to be the same as originally planned for.

Condition (*b*) of the permit, however, has not been complied with inasmuch as no auxiliary pumping or power equipment in addition to and independent of that shown by the plans for the pumping station has been provided. Although as pointed out in my report on the examination of the approved plans under date of May 18, 1914, the proposed pumping equipment provided for is equal to about four times the probable average flow of sewage contributed by the present population, no provisions are made by the plans to provide against a failure in the supply of the electric current and therefore do not give reasonable assurance of a continuous operation of the disposal plant.

Under the proposed conditions a failure of the current for a period of more than about 30 minutes would flood the pump wells causing the sewage to set back in the sewer system with the result that the cellars of the houses in the lower sections of the village would probably become flooded giving rise to general insanitary conditions. Such conditions should be provided against by installing an auxiliary engine and electric generator to supply current in case of a failure of the regular current or by installing an engine and additional pump and such auxiliary power or pumping equipment should be shown by the plans.

In view of the above, I would recommend that the plans be returned and that the village authorities be advised that the plans cannot be approved until auxiliary pumping or pumping equipment of adequate capacity to care for the probable flow of sewage at the pumping station in addition to and independent of that now shown by the plans be added to the plans. I would also recommend that the attention of the village be called to the discrepancy between the specifications and the plans for the proposed sludge bed with reference to its depth and that a statement be submitted as to whether the specifications or the plans are to be followed in the construction.

ALBANY, N. Y., *July* 25, 1914

Amended plans for sewage disposal for the village of Lyons, Wayne county, were submitted to this Department for approval on August 15, 1914.

According to a note on the plans and the supplementary report of the engineers now submitted with the plans it appears that auxiliary power for the pumping station is to be provided for by a generator to be driven by an oil engine in the water works pumping station to be located near the disposal plant. The letter of the village attorney recently received also states that the Central New York Gas and Electric Company which furnished electricity for the village has a number of generating stations which are interconnected as well as connections with the Niagara, Lockport, and Ontario Power lines and with the power station of the Rochester, Syracuse and Eastern Electric R. R. Company. It appears, therefore, that adequate provisions are made to provide for a continuous operation of the pumping station.

I would therefore, recommend that the plans be approved. It should not, however, be necessary to issue a permit in connection with the approval of these plans inasmuch as they were submitted in accordance with the requirements of the permit issued to the village on May 21, 1914, which allows the discharge into Black brook and Clyde river of effluent from the sewage disposal plant to be constructed in connection with the proposed sewer system of the village.

ALBANY, N. Y., *August* 19, 1914

The plans were approved on August 20, 1914

MARION (Wayne County Canning Co.)

Plans for a sewage disposal plant consisting of a settling tank, siphon chamber and subsurface irrigation system to treat the sanitary sewage of the Wayne County Canning Co. Ltd. were approved on July 17, 1914, on condition that no portion of the subsurface irrigation field should be constructed within 25 feet of the stream flowing past the property and that the plant be limited to the treatment of sewage contributed by not more than 60 persons. The report on the examination of the plans follows:

Plans for a proposed sewage disposal plant to treat the sanitary sewage from the factory of the Wayne County Canning Company, Ltd. at Marion, N. Y., were submitted for approval.

Plans for the disposal of sanitary sewage from this plant were originally submitted on March 7, 1914, and the plant proposed at that time was to consist of a settling tank, siphon chamber and crushed stone filter. These plans were returned for revision inasmuch as it was found that the area of the filters was not sufficient for the amount of sewage to be treated and no arrangements had been made to properly operate these filters either as contact beds or sprinkling filters.

The plans now submitted show a plant to consist of a settling tank, siphon chamber and subsurface irrigation system to be located northeast of the factory buildings. The plans are designed by J. P. Lawyer, engineer, Clyde, N. Y.

It is stated that the maximum number of persons which the sewage disposal plant will be required to serve will be sixty and that this maximum will occur only during the summer months. With an assumed sewage contribution of sixty gallons per person daily the flow of sewage would be 3600 gallons daily and the capacity of the settling tank provides for a detention in the tank of about 24 hours. The tank is properly designed with baffles and the siphon chamber is of such size as to provide a dose which will fill each section of the subsurface irrigation system a little over half full.

The soil in which the subsurface irrigation system is to be laid is described as gravelly with an occasional clay strata, and it is proposed to excavate to a width of three feet around the distributing tile wherever it is necessary to cross a clay stratum and fill in with gravel. The tile is to be three inches in diameter and the joints are to be protected by a covering of tar paper. It is not stated in the report how deep the subsurface tile is to be laid below the surface but this should be not greater than 12 inches. There is to be provided 6,000 feet of subsurface tiling arranged in two sections of 3,000 feet each and the area of the field is approximately six-tenths of an acre so that the rate of irrigation will not exceed 6,000 to 10,000 gallons per acre per day.

The plans appear to be satisfactory and if the soil in which the subsurface system is to be located is fairly porous and not too many strata of clay are present, the plant should operate properly if carefully constructed and the joints of the subsurface tiling well protected from becoming clogged with the back-fill.

I would recommend therefore that the plans be approved as presented on condition that no portion of the subsurface irrigation field be constructed within 25 feet of the stream flowing past the property.

ALBANY, N. Y., *July* 15, 1914

MEDINA

On January 28, 1914, plans for the change of location of a portion of the trunk sewer between Church and West streets were approved but no permit was issued inasmuch as the plans did not provide for any increase in the amount of sewage to be discharged. On May 21, 1914, plans for sewers in

Oak Orchard, Genesee, Fuller and other streets were approved and a permit was issued allowing the discharge into Oak Orchard creek of effluent from the proposed sewers, on condition that on or before February 1, 1915, the village of Medina shall submit to this Department for approval, satisfactory detailed plans for works for the partial treatment by sedimentation or clarification of the entire sanitary sewage of the village.

On June 27, 1914, a proposition to construct a sewer in Stork street in the village of Medina under and in accordance with section 21-a of the Public Health Law was approved and on November 10, 1914, a proposition to construct a sewer in Stork, Gulf and Oak streets between Ryan street and Glen avenue was approved on condition that before the construction of said sewers the plans therefor shall first be submitted to this Department for approval. Plans for proposed sewers in Stork, Gulf and Oak streets were submitted for approval in accordance with the above requirements on November 13 and were approved on November 23, 1914. The reports on the examination of the plans and the conditions of the permits issued, follow:

Plans for proposed change of location of the portion of the trunk sewer between Church and West streets in the village of Medina, Orleans county, were submitted to this Department for approval by the Sewer Commissioners on January 15, 1914.

The original plans for sewerage for Medina were approved by the then State Board of Health on April 9, 1890, and on February 27, 1907, plans showing alterations and extensions to the original sewer system were approved. These latter plans provide for a trunk sewer connecting the proposed sewer in the eastern and southern portions of the village with a main outlet sewer in Rock street. This trunk sewer which was shown to be 24 inches in diameter with a slope of .15 per cent. was to be laid on the bottom of the Erie canal between Church and West streets, a distance of 1520 feet.

It appears from the application submitted with the present plans that the Superintendent of Public Works of the State has ordered the village to remove this sewer from the canal bottom and that he has given them permission to construct this portion of the sewer behind the retaining wall on the westerly side of the Barge canal between Church and West streets. Although the new location of this sewer will increase its length somewhat the size and minimum slope on which it is to be constructed and consequently its carrying capacity is to be the same as the original sewer. Manholes are to be constructed at all points of abrupt change of slope and alignment and the sewer will be more accessible for cleaning and inspection than before.

I would therefore recommend that the plans for the proposed change of location of this portion of the trunk sewer be approved. It should not be necessary however, to issue a permit in connection with the approval of these plans inasmuch as they do not provide for an increase in the amount of sewage to be discharged, nor do they provide for any change in the point of discharge of such sewage.

ALBANY, N. Y., *January* 20, 1914

These plans were approved on January 28, 1914.

Plans for proposed sewer extensions in the village of Medina, Orleans county, were submitted to this Department for approval on April 11, 1914. Application for the approval of the plans and the issuance of a permit signed by the Sewer Commissioners of the village was received on May 1.

The records of the Department show that the original plans for the sewerage system of the village were approved by the then State Board of Health on April 9, 1890. Plans for alterations and extensions to this system have been approved from time to time since then. On October 11, 1913, a proposition to construct sewers in Oak Orchard, Genesee and Fuller streets submitted under section 21-a of the Public Health Law was approved. The Board of Trustees of the village was notified at the time of the approval of this proposition that, in accordance with the requirements of sections 76 and 77 of the Public Health Law, it would be necessary for the village to submit plans showing the proposed sewer extensions and make application for the issuance of a permit.

The plans now under consideration were submitted in accordance with the above requirements and show that it is proposed to construct comparatively short sewer extensions in Park avenue and North avenue in addition to the sewers in Oak Orchard, Genesee and Fuller streets referred to above. These sewers are to vary in size from 8 to 18 inches in diameter and are to be constructed with slopes sufficiently steep to produce self-cleansing velocities and to prevent clogging under ordinary conditions. Manholes are to be constructed at changes of alignment, at sewer intersections and at intermediate points not more than 548 feet apart. Flush tanks are to be installed at the upper ends of the sewers.

All of the proposed sewers are to be tributary to the existing outlet sewer which discharges into Oak Orchard creek below Sweet's dam. From our careful examination of the plans, it was found that the proposed sewers are satisfactory both from a sanitary and hydraulic point of view and if properly constructed should properly care for the sanitary sewage of the section to be served by them.

The construction of these sewers, which cover a considerable area in the southwestern section of the village, will ultimately materially increase the pollution of Oak Orchard creek. This stream flows through a fairly thickly populated rural district between Medina and Lake Ontario, a distance of some 19 miles measured along the creek. There are also a number of small hamlets along the creek which would in all probability be affected by any nuisance caused by the discharge of sewage into Oak Orchard creek especially during very low flows in the summer.

In view of the above and in view of the consistent policy of the Department of requiring that in all future sewer construction in this State consideration should be given to the future disposal of sewage I am of the opinion that the village of Medina should at an early date take steps to provide for at least a partial purification of its sewage by sedimentation or clarification.

I would therefore recommend that the plans be approved and a permit be issued allowing the discharge of sewage from these sewers into Oak Orchard creek and that the permit contain in addition to the usual revocation and modification clauses the condition that on or before February 1, 1915, detailed plans for a partial treatment by sedimentation or clarification of the entire sanitary sewage of the village, together with general plans for additional works for more complete treatment of such sewage be submitted to this Department for approval.

ALBANY, N. Y., *May* 7, 1914

PERMIT

The permit issued in connection with the approval of these plans on May 21, 1914, contains the following conditions:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary.
2. That the issuance of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.
3. That only sanitary or domestic sewage and no storm water or surface water from streets, roofs or other areas shall be admitted to the proposed sewers.
4. That on or before February 1, 1915, the village of Medina shall submit to this Department for approval, satisfactory detailed plans showing works for partial treatment by sedimentation or clarification of the entire sanitary sewage of the village together with general plans for additional works for more complete treatment of such sewage.
5. That upon approval of said plans and when required by the State Commissioner of Health the works for partial treatment of sewage shall be constructed and put in operation within a time limit there specified.

Plans for proposed sewer extensions in Stork, Gulf and Oak streets in the village of Medina, Orleans county, were submitted to this Department for approval by the Board of Sewer Commissioners of the village on November 13, 1914.

The records of the Department show that on June 27, 1914, the proposition to construct a sewer in Oak street and through private property between Ryan street and Glenwood avenue submitted under and in accordance with section 21-a of the Public Health Law was approved and on November 10, 1914, a proposition to construct a sewer in Stork, Gulf and Oak streets between Ryan street and Glenwood avenue, constituting an amendment of the first proposition was approved. Both of these propositions were approved on condition that no surface or storm water shall be allowed to enter such sewers and that before construction the plans therefor shall first be submitted to this Department for approval.

The plans now presented were submitted in accordance with the above requirements and show that it is proposed to construct some 2200 feet of 12-inch sewer in Stork, Gulf and Oak streets, between Ryan street and Glenwood avenue. The proposed sewer is to be constructed with a slope of .45 per cent. and is to be tributary to the existing 24-inch outfall sewer in Glenwood avenue which empties into Oak Orchard creek below Sweet's dam in the town of Ridgeway. Although this sewer appeared to be somewhat larger than necessary to care for the sanitary sewage of the section to be served by it, I am of the opinion that if properly constructed it should amply and satisfactorily meet the future needs for sewerage in this section.

The present condition of sewerage and sewage discharge from existing sewers of the village and the urgent needs for the treatment of this sewage in the future was reviewed in my report on examination of plans for sewer extensions in Oak Orchard, Genesee and other streets under date of May 7, 1914, and will, therefore, not be reviewed at this time, except to state that the permit issued to the village authorities allowing the discharge of sewage from the proposed sewers under date of May 21, 1914, contains in addition to the usual revocation and modification clauses, the following conditions:

1 That on or before February 1, 1915, the village of Medina shall submit to this Department for approval, satisfactory detailed plans showing works for partial treatment by sedimentation or clarification of the entire sanitary sewage of the village together with general plans for additional works for more complete treatment of such sewage.

2 That upon approval of said plans and when required by the State Commissioner of Health the works for partial treatment of sewage shall be constructed and put in operation within the time limit then specified.

In view of the above I would recommend that the plans be approved and a permit issued allowing the discharge of sewage from the proposed sewers in Stork, Gulf and Oak streets into Oak Orchard creek below Sweet's dam in the town of Ridgeway on the same conditions with reference to plans for sewage disposal as the plans referred to above were approved.

ALBANY, N. Y., *November* 19, 1914

PERMIT

A permit, containing the following conditions, was issued in connection with the approval of these plans on November 23, 1914:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary.
2. That the issuance of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.
3. That only sanitary or domestic sewage, and no storm water or surface water from streets, roofs or other areas shall be admitted to the proposed sewers.

4. That on or before February 1, 1915, the village of Medina shall submit to this Department for approval, satisfactory detailed plans showing works for partial treatment by sedimentation or clarification of the entire sanitary sewage of the village, together with general plans for additional works for more complete treatment of such sewage.

5. That upon approval of said plans and when required by the State Commissioner of Health the works for partial treatment of sewage shall be constructed and put in operation within the time limit then specified.

MOUNT MORRIS

Amended plans for sewerage and sewage disposal for the village of Mount Morris were submitted for approval on March 7, 1914, but were returned for revision inasmuch as they were not in satisfactory condition for final acceptance. Plans modified in accordance with the requirements of the Department were again submitted on October 22, 1914, and were approved on November 10, 1914. These plans provided for two sewage disposal plants consisting of settling tanks of the Imhoff type and sludge drying beds. The reports on the examination of the plans and the conditions of the permit issued are printed below.

Plans for sewerage and sewage disposal for the village of Mount Morris, Livingston county, were submitted to this Department for approval by the board of trustees on March 7, 1914.

The records of the Department show that original plans for sewerage and sewage disposal for the village were approved on September 1, 1905. The proposed sewer system, which was designed on the separate plan, covered all developed sections of the village except the outlying portions of a few streets on the outskirts of the village, and the disposal plant provided for by these plans, which was to serve the greater portion of the village, comprised a septic tank, dosing chamber and six intermittent sand filters to be located just east of the Pennsylvania R. R. tracks and about 500 feet southeast of the intersection of Murray and Genesee streets. All except the proposed sewers in Main street north of Mill street and in Mill street and Lackawanna and Sickles avenues were to be tributary to the sewage disposal plant. These sewers were planned to discharge directly into the mill race near the intersection of Main and State streets. This section of the village appears to be too low to permit of carrying the sewage by gravity flow to the disposal plant. A note on the plans, however, indicates that it is proposed to pump the sewage into the gravity system or the disposal plant whenever required.

The plans now submitted were prepared by Monroe D. Baker, civil engineer, of Mount Morris, and comprise:

1. Three blue prints of the topographical map of the village showing the sewer system, proposed sewer extensions and location of sewage disposal plant.
2. One tracing and four blue prints of the proposed sewage disposal plant.

The report of the designing engineer accompanying the plans states that although it is not the intention of the village to construct any sewers not shown by the original plans at this time the plans show proposed extensions to the system in outlying streets in order to make these plans more comprehensive than the original plans. It is also proposed to substitute a settling tank of the Imhoff type for the septic or plain settling tank originally planned for.

The village of Mount Morris is situated in the northern part of the town of the same name on the Genesee river near its confluence with Canaseraga creek. It is provided with an unfiltered water supply taken from springs and a small stream and the works are controlled by the Mills Water Works Company. It appears that this supply is inadequate and the village contemplates putting in a new supply derived from Silver lake. The village is not provided with sewers and the sewage is at present disposed of largely by means of cesspools and privy vaults.

The population of the village according to the 1910 census is approximately 2,800 and its area is about 1,100 acres, giving a density of population of about 2½ per acre. A large portion of the eastern section of the village is bottom land, subject to inundations during floods and will therefore probably not be developed for residential purposes, so that the ultimate average density of population over the entire area will probably not exceed 5 persons per acre. Based on this density it is assumed that the population ultimately to contribute sewage from the village will be approximately 5,500.

The plans have been carefully examined with respect to the sewerage system and sewage disposal works. In connection with the sewerage system the design has been studied carefully with reference to alignments, sizes, grades, capacities, and other features of a hydraulic or sanitary nature. In connection with the means for sewage disposal it has been studied with reference to the general method and efficiency of the sewage disposal plant as a whole and of the capacities and practical operation of the individual structures.

The sewers of the system as originally planned vary in size from 8 to 15 inches in diameter and appear to have been designed with adequate capacities to care for the probable ultimate population tributary to the system and no changes are to be made in the sewers as originally planned. The proposed extensions to the system shown on the plans by dotted lines cover portions of Sickles avenue, Olp road, Chapel, Murray, Case and South Main streets. Except for the sewers in Olp road and Chapel and Case streets, which are to be 8-inch sewers, the sizes of the proposed sewers are not shown. It appears, however, that all the sewers are designed with slopes sufficiently steep to give self-cleansing velocities in them under ordinary conditions and manholes are to be installed at all points of change of alignment in order to facilitate cleaning and inspection.

As noted above, the original plans provided for the discharge of sewage from the sewers tributary to the Mill street outlet directly into the mill race without treatment and indicate that it is ultimately intended to pump the sewage from this outlet either to the gravity system or to the disposal plant. I am of the opinion that owing to the uncertainty of flow in the tail race and the small size of the stream no raw sewage should be discharged into it and immediate provisions should be made for carrying this sewage to the disposal plant.

Prof. Olin H. Landreth, formerly consulting engineer of this Department, stated in his report on the examination of the original plans in 1905 that his examination of the site of the proposed sewage disposal plant showed that it is to be located on the river flats at a considerable distance from the built up portion of the village in a place not likely to be built up on account of the fact that annual freshets of the river overflow the territory chosen and that in his opinion the site would be a suitable one for an efficient system of disposal and one that would not give rise to odors to any appreciable extent.

These plans as well as the present plans provide for the discharge of effluent from the disposal plant into the tail race which heads at the Genesee river near the Main street bridge and discharges into Canaseraga creek about 1¼ miles below the plant and at a point about 1 mile above its confluence with the Genesee river. Except the statement in the report of the designing engineer submitted with the present plans, that the point of discharge is below the confluence of two mill races and that the water in the race is used by several mills and provides adequate flushing of the tail race, no data as to the actual flow of the water in this watercourse nor as to the fluctuations of flow in the tail race have been submitted.

Canaseraga creek at the mouth of the tail race has a drainage area of 259 square miles with an estimated minimum flow of 30 cubic feet per second. The drainage area of the Genesee river at Mount Morris is about 1,100 square miles and the minimum monthly flow of the river at this point in 1895 is given by Geo. W. Rafter as 100 cubic feet per second. The Genesee river below the mouth of Canaseraga creek has a drainage area of about 1,407 square miles. It is evident therefore that there is sufficient flow in either of these streams to permit of the discharge of effluent from the preliminary treatment works at Mount Morris without objection, especially since no public water supplies are taken from the river or creek below the village.

I am of the opinion therefore that a study should be made by the village authorities of the practicability of extending the effluent pipe to the Genesee river or to Canaseraga creek, or of so locating the disposal plant as to permit of discharging the effluent directly into either of these streams. If it was found possible to do so either by extending the effluent pipe or changing the location of the plant to a site nearer these streams, preferably the Genesee river, there would possibly be no objection to deferring the construction of the supplementary treatment works until sometime in the future and constructing only the Imhoff tank at this time, in which case it would be necessary to show only general plans of the supplementary treatment works, leaving the details to be worked out at some future time. If, however, it is found to be more expensive to carry the effluent to either the river or the creek, I do not believe it would be permissible to omit even temporarily the construction of the supplementary treatment works.

With respect to the sewage disposal plant, it is found that it is proposed to substitute a settling tank of the Imhoff type for the septic or plain settling tank shown by the original plans and to provide a sludge drying bed for the disposal of sludge. The plans show no change in the design of the sand filters nor in the location of the disposal plant which is to be situated in the eastern portion of the village.

The plans, however, do not show sufficient details nor does the report contain enough data to permit of an intelligent examination of them. Only the plan and one cross section of the Imhoff tank are shown, and although dimensions of the cross section are given there are no other details, such as length of tank, elevation of flow line and of different portions of the tank, the size of the sludge pipe, the material of construction, dimensions of baffles and partition walls, etc. There are moreover no dimensions shown on the plan of the tank nor is there a longitudinal section of it, so that it is impossible to determine with any degree of accuracy the capacity of the settling compartment of the tank.

It is proposed to dispose of the sludge from the settling tank on the sludge drying bed 40 feet by 35 feet in area. This bed is to be divided by means of wooden partitions into four sections. Although the report of the engineer states that the sludge bed is to be similar to the proposed sand filters, no section of the bed nor details of the distributing and underdrain systems of the bed are shown nor are the elevations of the different portions of the bed given. It is not usual, however, to construct sludge beds for the disposal of Imhoff tank sludge with as great a thickness of sand as intermittent sand filters. Sludge beds are usually constructed with from 12 to 18 inches of filtering material composed of graded gravel or broken stone underlying a thin layer of sand varying from ¼ to 1 inch in thickness. The sludge drying bed should be provided with adequate distributing and underdrain systems.

It appears from the plans that it is not proposed to modify the sand filters comprising the supplementary treatment works. These filters, which are to be 3 feet deep, are divided into 6 units having a total combined area of .65 acres. Except for the cross section through two of the filters no details of the design are shown, such as distributing troughs and underdrain systems, nor is the size of the sand given.

It appears from the report of the designing engineer submitted with the original plans that the proposed sand filters were designed to care for a flow of 150,000 gallons per day, although no definite population for which the plant was to serve was given in this report. The plans provided that when the amount of flow became greater another unit should be added. Although the area of the sand filters proposed at that time and which area is retained in the present design might have been sufficient to treat the sewage from a considerable part of the population the conditions regarding the water supply have changed, there being a new and adequate supply of water, and on the assumption that 2,000 people would contribute sewage to the plant, the area of the sand filters now necessary would be three times the original area. If the population expected to contribute sewage to the disposal works were, as seems reasonable soon after the plant is first constructed, 2,500 instead of 2,000, the area of the sand filters necessary would be four times the area shown by the plans.

In view, therefore, of the comparatively large area required for the proper construction of sand filters and the lack of necessity at this time of a comparatively high degree of purification that would be accomplished by sand filtration, it would seem that a study should be made to determine if other methods of treatment and other points of discharge of effluent might be adopted and yet fiulfill the necessary requirements for organic purification. Contact beds and sprinkling filters require very much less area than sand filters and though their organic purification is less, it is possible that their efficiency would be sufficient in this particular case. Furthermore, owing to the very much greater volume of the Genesee river or even of Canaseraga creek as compared to the flow of the mill race into which it was proposed to discharge the effluent from the plant, it is possible that no greater purification than that accomplished by efficient settlement and possibly sterilization might be sufficient to avoid any objectionable conditions in these streams and would be less objectionable and more economical to Mt. Morris than the method and location of the works proposed.

In conclusion I would state that it is found from our examination of the plans that they are not in satisfactory condition for approval and that before they could be finally passed upon they should be modified and additional data submitted as follows:

1. Detailed plans for conveying the sewage from the Mill street outlet to the disposal plant should be submitted.
2. Cross section through the disposal plant site showing elevations of different portions of the plans with reference to the inlet and outlet sewers and to the high and low-water mark of the tail race, river and creek should be submitted.
3. Longitudinal section through the Imhoff tanks giving dimensions and elevations of the different portions of the tank should be shown on the plans.
4. Plans showing sections and details of the construction of the proposed sludge bed should be shown.
5. If sand filters are to be retained they should be designed in general accordance with the following requirements:
   (a) The bed should be large enough to care for the entire present population when operating at the rate of about 100,000 gallons per day on the basis of a daily contribution of sewage of 100 gallons per capita.
   (b) Sand filters should have a depth of not less than three feet above the underdrain system.
   (c) The underdrain should be laid in shallow trench and should be surrounded and covered with not less than 6 inches of graded gravel and broken stone to prevent the sand from clogging the underdrains.
   (d) The sand composing the filtering material should have an effective size of not less than .2mm. nor more than .6mm.
6. If contact beds are used they should be designed to operate at a rate not exceeding 100,000 gallons per acre per day per foot of depth of filtering material for depths of from 4 to 7 feet assuming a daily per capita flow of 100 gallons.
7. If sprinkling filters are used they should be operated at a rate not exceeding 300,000 gallons per acre per day per foot of depth between depths of 5 and 8 feet on the same basis of sewage contribution.
8. Elevation of low, mean and high-water marks of the river, creek and tail race should be shown on the plans.

A more complete report of the designing engineer should be submitted embodying a statement as to the tributary population, the basis of design used, the maximum, manimum and average flow of water in the tail race in order to permit of our final examination of the plans. The report should also discuss the nature of the sewage, i. e., the relative proportion of domestic sewage and industrial or factory wastes and the degree of treatment to which it is proposed to subject the factory wastes, if any, before allowing their discharge into the sewer system.

I would, therefore, recommend that the plans be returned to the village authorities for modification and the submission of additional data in accordance with the above recommendations and that further studies be made of alternate plans of sewage disposal and outfall sewers which might be adopted as discussed in this report.

ALBANY, N. Y., *April* 7, 1914

Amended plans for sewerage and sewage disposal for the village of Mt. Morris, were submitted to this Department for approval by the board of trustees on October 22, 1914.

The examination of the plans now submitted shows that they have been revised in general accordance with above requirements and provide for a comprehensive sewer system covering practically the entire village and for the treatment of the sewage to be collected by this system in two sewage disposal plants. According to the plans and the report of the designing engineer, no sewers are shown in Shepherd, Erie and Simerson streets nor in portions of State street and Lackawanna avenue. The report of the engineer states that Shepherd street is a private right of way, that Erie street is simply a farm lane and that both of these streets are located at such a low elevation that they are affected by flood water from the Genesee river and will, therefore, probably not be developed to any extent in the future. The lower portion of State street has at present no houses on it and it is improbable, according to the report, that any houses will be constructed on this portion of the street on account of the flood water conditions. Only a portion of Lackawanna avenue can be sewered by gravity owing to the elevation of the ground along this street. Simerson street is only a short street about 300 feet long and the engineer states in his report that the three houses on this street at present can be served by the proposed sewer in Main street.

The plans provide for a modification of the 12-inch sewer shown by the original plans extending from Spring street to the disposal plant and show that it is proposed to extend this sewer along the westerly side of the Pennsylvania railroad instead of along the easterly side of the railroad as originally planned for. This change of alignment permits of raising the elevation of the flow line in the settling tank at the main disposal plant from elevations 54.5 to 60. The lower portion of the main outfall sewer which is some 200 feet long, is to be 12 inches in diameter and is to be constructed with a slope of .5 per cent., giving a carrying capacity to this sewer when flowing full of about 1,500,000 gallons per day. The capacity of this portion of the outfall sewer is somewhat smaller than the main sewers tributary to it and it is possible that it will be necessary to enlarge this section of the sewer before the end of the useful life of the system.

It is proposed to treat the sewage of the proposed sewer system in 2 sewage disposal plants consisting of settling tanks of the Imhoff type and auxiliary sludge beds for the disposal of sludge. The report of the engineer states that the estimated present population tributary to the main disposal plant which serves the high level portions of the village is about 2,500 and the population tributary to the smaller or low level plant is about 500. The disposal plants, however, have been designed to serve 3,100 and 700 persons respectively.

The main plant serving the greater portion of the village is to be located on the easterly side of the Pennsylvania railroad tracks between Murray and Hopkins streets extended. This tank will be considerably above the high-water mark of the tail race at this point. The plans also show a general layout for seven sand filters having a total area of 4.5 acres which may be constructed in the future should a more complete treatment of the sewage than that provided for by sedimentation be required. It appears also that there is sufficient fall available at the plant to operate either contact beds or sprinkling filters.

The small sewage disposal plant is to be located between State street and the mill race. This plant is to serve the low level section of the village including the proposed sewers in Main and Mill streets and Sickles and Lackawanna avenues, which sewers have a total length of about 7,200 feet. It is to be located slightly above the normal low water level of the tail race or mill race and both the plant and the 10-inch outfall sewer in State street and the lower portion of Mill street for a distance of 2,500 feet, will, according to the report of the engineers, be back watered annually by reason of the high water conditions in the tail race caused by the backing up of the flood waters of the Genesee river. The 10-inch sewer leading to the sewage disposal plant is to be constructed on a rather flat slope of .2 per cent. It is therefore, important that this sewer should be carefully constructed and that it should be inspected and cleaned regularly and systematically in order to prevent clogging and silting up of this sewer. It appears from the report of the engineer that the flood waters of the Genesee river reach an elevation of about 42′ or about 5.3′ above the flow line of the settling tank and that it will be necessary to pump the effluent from the small settling tank to the main disposal plant should additional treatment of the sewage of the village ever be required.

The settling tank of the main plant is to be a horizontal flow tank of the Imhoff type 20′x20′ in plan, 28.5′ deep with a maximum depth of liquid of 26.5′ The tank which is to be covered is to be constructed of reinforced concrete. The greater portion of it will be above the general ground level, at this point. The tank is to be divided by means of reinforced concrete partitions into a single upper or settling compartment and one lower or sludge compartment. The settling compartment has sufficient capacity to give an average time of detention of the sewage contributed by 3,100 persons of about 2¼ hours on the usual assumption as to per capita rates of water consumption.

The sludge compartment has a capacity sufficient to give nearly 6 months' detention of sludge on the basis of design used. The two sides of the hopper shaped bottom forming the bottom of the tank are designed on slopes of 1 on 2. The other two sides, however, are shown with slopes of only 1 on 3⅓. Although a flushing pipe is provided for this compartment, I am of the opinion that the slope of the bottom should not be less than 1 on 2 in order to facilitate the removal of the sludge.

The transition well which extends from the sludge compartment to a manhole opening in the top of the tank is shown only 3 feet square. This appears to be too small and would be liable to become choked with scum. It is usual to have the area of the transition rooms from ⅓ to ¼ the area of the sludge compartment. This could readily be obtained in the present design by extending the present transition chamber from the inlet to the outlet end of the tank and maintaining a width of 3 feet. This would divide the settling compartment into two portions, and I am of the opinion that such a change would give a more uniform flow of the sewage through the settling compartments than the proposed arrangement.

It is proposed to remove the sludge from the sludge compartment by means of a 6-inch sludge pipe extending from a point near one side of the apex of the sludge compartment. I am of the opinion that it would be better to have the sludge pipe extend from a point directly above the apex to the sludge hopper and to have the end directly below the manhole opening of the top of the tank where it would be accessible for cleaning and inspection. The sludge is to be discharged to an adjacent sludge drying bed under a head of 15.5 inches. This sludge bed has an area of 2,080 square feet, and is to be filled with filtering material composed of 12 inches of coarse gravel or broken stone, 6 inches of fine gravel and 3 inches of coarse sand, in the order named from the bottom up. The underdrains of the bed are to consist of 4-inch tile spaced 8 feet center to center and a main 6-inch underdrain connected with the outfall sewer of the disposal plant. The proposed sludge bed is of adequate size to care for a population of about 6,000 persons and the design of the plant is, therefore, not well balanced, inasmuch as the settling tank is designed for a population of only about 3,000.

The settling tank at the small plant is to be a horizontal flow tank of the Imhoff type, 16 feet in diameter, 28 feet deep with a depth of 20.5 feet below the flow line. It is to be divided into an upper settling compartment and a lower sludge compartment. The upper compartment will give a time of detention of about 2.5 hours on the basis of design used. The slope of the bottom of the sludge compartment is to be 3 on 5.

A 4-inch sludge pipe is shown extending from a point above the apex of the tank to a point below the manhole opening in the top of the tank. It is to be connected with a hand-operated sludge pump provided with a 2½-inch discharge pipe leading to the sludge bed. I am of the opinion that it would be difficult to remove the sludge from the tank by a hand-operated pump discharging through a small discharge pipe. If it is found impossible to remove the sludge by the method proposed a power-driven sludge pump with a larger discharge could, however, readily be substituted for the design shown.

The sludge bed to be constructed in connection with this tank is of similar design to the sludge bed for the large plant and is to have a superficial area of 240 square feet. The underdrains from this sludge bed are to discharge into the settling tank. According to the report of the engineer it is proposed in the future, if more complete treatment is required, to discharge the effluent from the settling tank for further treatment on the sand filters of the main disposal plant.

The effluent from the main settling tank is to be discharged into the 12-inch outlet sewer from the small plant on the north side of the tail race through some 1,600 feet of 15-inch vitrified tile pipe laid on a slope of .3 per cent. From this point the effluent from both plants is to be conveyed through about 900 feet of 18-inch outlet sewer laid on a slope of .12 per cent. on the northerly side of the tail race above the Delaware, Lackawanna and Western railroad bridge where there is a minimum depth of water of about 4 feet. Provisions are made for continuing this sewer to a permanent outlet into Canaseraga creek near its confluence with the tail race, a distance of about 5,600 feet below the temporary outlet. The entire outfall sewer appears to be well above the low water level of the tail race.

The report of the village engineer states that the tail race, which is to receive the sewage temporarily, carries the entire flow of the Genesee river during the dry part of the summer and has a minimum flow of 100 cubic feet per second. The dry weather flow of the Canaseraga creek is estimated at about 30 cubic feet per second. It is also stated that there are no houses near the tail race below the temporary outlet, that the banks are steep and that no cattle are watered in the tail race below this point.

I am of the opinion that the effluent from the proposed sewage disposal plants may safely be discharged into the tail race through the temporary outlet near the Delaware, Lackawanna and Western railroad bridge, without objection at this time. If, however, any objectionable conditions are created, in the future by the discharge of effluent at this point either by reason of the amount of sewage treated or because of change of flow in the tail race, the outlet sewer should be extended to Canaseraga creek or supplementary treatment works constructed.

In conclusion I would state that it appears from our examination of the plans that they have in general been designed to meet the local requirements for sewerage and sewage disposal. There are, however, certain features in connection with the design of the sewage disposal plants, as noted above, which could be modified to advantage. These features are not of sufficiently serious nature to warrant the disapproval of the plans, inasmuch as they affect more the maintenance than the efficiency of the plants. If, however, the village should desire, as I would recommend, to change the design to conform more to the standards indicated in this report, the plans could be amended and submitted at a later date as provided by the Village Law.

In view of the above, I would recommend that the plans be approved and a permit be issued allowing the discharge of effluent from the proposed sewage disposal plants into the tail race near the Delaware, Lackawanna and Western railroad bridge, on condition that whenever required by the State Commissioner of Health the outlet sewer shall be extended to Canaseraga creek or detailed plans for supplementary treatment works shall be submitted for approval.

ALBANY, N. Y., *November* 6, 1914

PERMIT

A permit, containing the following conditions, was issued in connection with the approval of these plans on November 10, 1914:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary.
2. That the issuance of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.
3. That both the sewer system and the sewage disposal works shown by plans approved this day shall be fully constructed in complete conformity with such plans or approved amendments thereof.
4. That only sanitary or domestic sewage and no storm water or surface water from streets, roofs or other areas shall be admitted to the proposed sewers.
5. That no sewage sludge from any part of the disposal works shall be discharged into the tail race or any other watercourse or body of water.
6. That whenever required by the State Commissioner of Health the outfall pipe shall be extended to Canaseraga creek.
7. That whenever required by the State Commissioner of Health satisfactory detailed plans for additional works for more complete treatment of the sewage of the village shall be submitted for approval; and that after approval of said plans any or all portions of such additional or supplementary works for more complete treatment of sewage shall be constructed and put in operation at such time or times thereafter as said Commissioner may designate.

On November 10, 1914, approval was given for the temporary omission from construction of all the portions of the sewer system and sewage disposal works shown by dotted lines on the general sewer plan approved this day.

NEW HARTFORD

Plans for the connection of the sewer system of the village of New Hartford with the sewer system and sewage disposal works of Sewer District No. 1 of the town of New Hartford were submitted for approval on March 9, 1914, and were approved on March 27, 1914. The report on the examination of the plans follows:

Plans showing a connection of the village of New Hartford sewer system and sewage disposal works of Sewer District No. 1 in the town of New Hartford, Oneida county, were submitted to this Department for approval by the board of trustees of the village of New Hartford on March 9, 1914.

The records of the Department show that original plans for sewerage and sewage disposal for the village of New Hartford were approved on December 31, 1896, and that on January 28, 1902, amended plans for sewerage and sewage disposal were approved. Although the sewer system provided for by these latter plans was constructed in 1902, it appears that the sewage disposal plant was never constructed owing to the difficulties encountered in obtaining a suitable site for the disposal plant and that the sewage of the village has been and is now being discharged without treatment into Sauquoit creek.

On April 12, 1912, plans were approved for a comprehensive sewer system for Sewer District No. 1 in the town of New Hartford and for a sewage disposal plant to be constructed and maintained jointly by the town and village. The outfall sewer of the sewer district was designed with sufficient capacity to care for the sewage of both the village and sewer district. The proposed connection of the village system with the town system was not shown by the approved plans, however, and it was therefore pointed out in our report on the examination of these plans that plans showing the proposed connection should be submitted for approval before the construction of such connection.

The plans now presented and under consideration were submitted in accordance with the above requirement and show that it is proposed to intercept the existing 18-inch outfall sewer of the village of New Hartford in Whitesboro street 800 feet above the outlet of the system and convey the entire sewage of the village to the Madison avenue sewer of the town system. The proposed connecting sewer which is to be 979 feet long is to be 18 inches in diameter and is to discharge into the Madison avenue sewer in the town at a point 40 feet south of Smith place.

The proposed connecting sewer is to be carried under Sauquoit creek and the adjoining tail race on straight slopes without the use of inverted siphons and at a sufficient depth below the bottom of these watercourses not to obstruct the flow in them. Cast-iron pipes with lead joints are to be used in the construction of this sewer under the streams and vitrified tile pipes with joints made of Jointite are to be used for the remaining portions of the sewer in order to prevent excessive infiltration of ground water.

The upper end of the proposed sewer is to be laid on a slope of .5 per cent. and the remainder of the sewer on a slope of .235 per cent. Although the capacity of the proposed connections is somewhat smaller than that of the existing outfall sewer in Whiesboro street which is laid on a slope of .39 per cent., the proposed sewer if properly constructed should be adequate as to size and capacity to care for the probable ultimate contribution of sewage from the village.

I would, therefore, recommend that the plans for the proposed sewer be approved. It should not be necessary, however, to issue a permit in connection with the approval of these plans inasmuch as the permit granted to the board of trustees on April 12, 1912, allowed the discharge into a tributary of Sauquoit creek of sewage from the village after treatment in the proposed sewage disposal plant which has since been constructed jointly by the sewer district and the village.

ALBANY, N. Y., *March* 26, 1914

NEW HARTFORD (Sewer District No. 1)

Plans for a modification of the sewer in Theime place and for proposed sewers in Proctor Boulevard West and Proctor Boulevard East in Sewer District No. 1 of the town of New Hartford, were submitted for approval on October 9, 1914, and after an examination of them were approved on October 20, 1914. The report on the examination of the plans follows:

Plans for amendments and extensions to the sewer system in Sewer District No. 1 in the town of New Hartford, Oneida county, were submitted to this Department for approval by the sewer commissioners on October 9, 1914.

Plans for a comprehensive sewer system covering the developed portions of the sewer district and for a sewage disposal plant consisting of an Imhoff tank and an auxiliary sludge bed for the disposal of sludge, to treat the sewage from both the sewer district and the village of New Hartford were approved by this Department on April 12, 1912. It appears that the sewer system and sewage disposal plant provided for by these plans have been constructed and put in operation.

The plans now submitted show that it is proposed to modify the proposed sewer in Theime place. The original plans approved by this Department provided for a 6-inch sewer with a slope of .75 per cent. in this street extending from a point near Osborn avenue to Madison avenue a distance of 1,200 feet. The plans now presented show that it is proposed to construct an 8-inch sewer with a slope of .763 per cent. in this street. According to the report of the designing engineer it was considered advisable to increase the capacity of the proposed sewer in order to better assure adequate sewerage facilities for this street.

Plans are also submitted showing that it is proposed to construct some 3,800 feet of 6-inch sewers in Proctor Boulevard West and Proctor Boulevard East in the so-called Proctor Boulevard subdivision. These sewers are to be connected with the existing 8-inch sewer in Genesee street opposite Mason place tributary to the district sewage disposal plant. The proposed sewers are to be provided with manholes at all points of change of slope and alignment. The distances between adjacent manholes average about 400 feet. The sewers are to be constructed with a slope of from 1.2 per cent. to 8.5 per cent, and an automatic flush tank is to be constructed at the upper end of each of the sewers.

From our careful examination of the plans, it appears that the proposed sewers if properly constructed should satisfactorily care for the sanitary sewage of the sections to be served by them. The sewage disposal plant of the sewer district, moreover, is of adequate capacity to care for the additional amount of sewage provided for by the proposed extension.

In view of the above I would recommend that the plans be approved and a permit be issued allowing the discharge, into a branch of Sauquoit creek near the New York Mill dike in the town of New Hartford. of sewage to be collected by the proposed sewers after such sewage shall first have been pased through the district sewage disposal plant.

ALBANY, N. Y., *October* 2, 1914

NISKAYUNA (Sewer District No. 2)

Plans for a proposed sewer swstem for Sewer District No. 2 in the town of Niskayuna, Schenectady county, were submitted for approval on August 19, 1914, and were approved on September 4, 1914. The proposed sewer system is tributary to the Schenectady sewer system. The report on the examination of the plans and the conditions of the permit issued in connection with the approval of them, follow:

Plans for the proposed sewer system in Sewer District No. 2 in the town of Niskayuna, Schenectady county, submitted to this Department for approval by the sewer commissioners of the district on August 19, 1914.

The sewer district which covers an area of about 70 acres on both sides of Union street is located adjacent to the easterly city line of Schenectady. The plan also covers an area of about 60 additional acres adjacent to the district which the designing engineer states includes practically all of the territory in this section of the town tributary to the Schenectady sewer system by gravity flow. Application, however, is made only for the approval of plans for the proposed sewers within the sewer district and only these sewers will be considered at this time.

According to the application, there are at present, over 80 houses in the sewer district equal to about one-third of the estimated ultimate number of houses that can be built in the district. Assuming an average population of five persons per house, the ultimate population of the district tributary to the proposed sewers will be about 1,200 or about 18 per acre. It is stated that most of the houses are provided with cesspools which are becoming a menace to the health of the community and it is, therefore, proposed to provide for a sewer system to cover the entire district in order to relieve the insanitary conditions caused by the use of cesspools.

The plans for the proposed sewer system which were prepared by Mr. W. W. Chadsey, civil engineer of Schenectady, and have been approved by the city engineer and architect of Schenectady, provide for about two miles of sewers in the district tributary to the existing sewers in Union street and Eastern avenue in the city of Schenectady. It is stated in the report of the designing engineer that permission to connect with the Schenectady sewer system will be received from the common council and board of contract and supply of the city at the next meeting of these bodies.

The proposed sewers are to vary in sizes from 8 to 12 inches in diameter and are to be constructed with slopes sufficiently steep to give self-cleansing velocity in the sewers under ordinary conditions. Manholes are to be placed at all changes of slope and alignment, at street and sewer intersections and at intermediate points on straight alignments not more than 500 feet part. The plans also show lampholes at the upper ends of the sewers in Ray street, Cornelius avenue, Ballston road and Union street. Except the sewer in Ray street where there is only a distance of about 200 feet between the lamphole and the nearest manhole at Margaret street, the sections of sewers referred to are rather long and have comparatively flat slopes. I am of the opinion, therefore, that except at Ray street either automatic flush tanks or manholes should be substituted for the lampholes shown by the plans.

From our careful examination of the plans it appears that the proposed sewer system if modified as noted above and properly constructed should satisfactorily care for the sanitary sewage of the sewer district.

I would, therefore, recommend that the plans be approved and a permit be issued allowing the discharge of sewage of the proposed sewer district into the Mohawk river after such sewage has first been passed through the sewage disposal works in the city of Schenectady, after such works are constructed and put in operation.

ALBANY, N. Y., *September* 2, 1914

PERMIT

A permit, containing the following conditions, was issued in connection with the approval of the plans on September 4, 1914.

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary.
2. That the issuance of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.
3. That only sanitary or domestic sewage, and no storm water from streets, roofs or other areas shall be admitted to the proposed sewers.
4. That either manholes or flush tanks shall be substituted for the lampholes shown by the plans except in Ray street.
5. That the sewage from the proposed sewer system shall be passed through the sewage disposal works of the city of Schenectady when said works are constructed and put in operation.

NORTH HEMPSTEAD (Property of Mr. Benjamin Stern)

Plans for a sewage disposal plant consisting of a settling tank, dosing chamber and sand filter for the residence of Mr. Stern and a settling tank and subsurface irrigation system to treat the sewage from the gate lodge, superintendent's cottage, garage and barn on the property of Mr. Benjamin Stern at Roslyn in the town of North Hempstead were approved on June 30, 1914. The report on the examination of the plans and the conditions of the permit issued in connection with the approval of them follow:

Plans for sewage disposal for the property of Mr. Benjamin Stern, Roslyn, N. Y., in the town of North Hempstead, Nassau county, were submitted to this Department for approval on June 23, 1914.

The property comprises a large tract of land located on the westerly shore of Hempstead harbor and south of Motts Cove, an arm of the harbor. There are at present 4 houses on the property, the residence of Mr. Stern, gate lodge, superintendent's cottage and a building used as stable and garage. The sewage is at present cared for by means of 2 settling tanks which discharge into Motts Cove. One of these tanks serves the residence and the other the remainder of the buildings.

The settling tank of the residence is a covered concrete structure located about 150 feet from the building and has sufficient capacity to provide for a time of detention of about 24 hours on the basis of design used, namely, an average population of 20 persons contributing sewage at the rate of 100 gallons per capita per day. The settling tank is at present receiving in addition to the sanitary sewage a portion of the storm water or roof water from the house. It appears, however, that the storm water is to be entirely eliminated from the sanitary sewage and is to be discharged into the cove through a separate pipe. The settling tank for the remaining buildings is also a covered concrete tank having a capacity equal to about 2 days' flow of sewage from the estimated average population of 10 persons.

It appears that although no oyster beds are located in the immediate vicinity of the outlets to the existing sewage disposal plant the oystermen have been in the practice of bringing oysters into the cove for the purpose of fattening them in the brackish water. As pointed out to you in my report on the sanitary conditions of Hempstead harbor, which was transmitted to the Conservation Commission, these waters are not suitable for oyster culture. In the present case, however, it is planned to construct supplementary or additional treatment works at both plants. At the disposal plant for the residence a dosing tank and sand filter is to be added and at the other plant a dosing tank and subsurface irrigation field are to be constructed. According to the report of the designing engineer it appears that it is not practicable to convey all of the sewage of the property to one point for disposal and that it would not be practicable to eliminate entirely the discharge of effluent from the disposal plant at the residence by the construction of a subsurface irrigation system owing to the topography of the ground.

The proposed dosing tank at the residence disposal plant is to be located adjacent to the settling tank and will have a capacity of about 600 gallons. From this tank the clarified effluent will be discharged intermittently to the sand filter.

This filter which is to be covered is to be divided into 2 units having a total area of 1000 square feet and so arranged that the two units may be operated alternately. The filter is to be underdrained by means of 2 lines of 4-inch tile pipe, surrounded by a layer of 2-inch pebbles. Above this layer of coarse pebbles is to be placed a 2-inch layer of ½-inch screened pebbles supporting a bed of sand 3 feet deep. The filter will be required to operate at the rate of 87,000 gallons per acre per day on the basis of design used and the effluent is to be discharged into Motts Cove through an existing 8-inch cast-iron pipe which terminates at a point about midway between high and low water marks.

The elevation of the bottom of the sand filter is to be about one foot below the high water mark and the lower portion of the filter will therefore be submerged at times of high water unless the bed is raised to prevent it. It appears from the plans that the elevation of the filter could readily be raised one foot by placing it closer to the settling tank. This should be done in order that the operation of the filter may not be interfered with at times of high water.

The proposed dosing tank at the disposal plant serving the lodge, superintendent's cottage, and the stable and garage is to be located adjacent to the existing settling tank and will have a capacity of about 300 gallons. The sewage from this tank is to be discharged intermittently into the distributing system of a subsurface irrigation field divided into 2 units, covering an area of about .12 acres.

The distributing system is to consist of 10 lines of special Waring distributing tile, 100 feet long, spaced about 5 feet apart. The tiles are to be laid with open joints with a slope of 3 inches to 100 feet and at a depth of about 16 inches below the surface of the ground. The tiles are to be laid on a layer of screened pebbles which will also extend about half way up the sides of the tile. The joints of the tiles which are to be ½ inch wide are to be protected by means of strips of 2 ply tar paper, 4 inches wide.

From our careful examination of the plans it appears that the proposed sewage disposal plants if properly constructed and operated with care should satisfactorily care for the sanitary sewage of the property and I would therefore recommend that the plans be approved and a permit be issued allowing the discharge into Motts Cove of effluent from the sewage disposal plant to be constructed to serve the residence of Mr. Benjamin Stern and that the permit contain in addition to the usual revocation and modification clauses the following conditions:

1. That the elevation of the proposed sand filters be raised sufficiently to prevent their operation being interfered with by high water.
2. That whenever required by the State Commissioner of Health the effluent pipe from the sand filters shall be extended to the low water mark of the harbor.

It should not be necessary to issue a permit in connection with the approval of the plans for the lodge, superintendent's cottage, stable and garage inasmuch as no discharge of effluent into the cove or harbor is contemplated by them.

ALBANY, N. Y., *June* 24, 1914

PERMIT

A permit, containing the following conditions was issued in connection with the approval of the plans on June 30, 1914.

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary.
2. That the issuance of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.
3. That both the sewers and sewage disposal works shown by plans approved this day shall be fully constructed in complete conformity with such plans or approved amendments thereof, except as provided in Condition 6 of this permit.
4. That only sanitary or domestic sewage and no storm water or surface water from grounds, roofs or other areas shall be admitted to the proposed sewers and sewage disposal works.
5. That no sewage sludge from any part of the disposal works shall be discharged into Motts Cove, Hempstead harbor or any other watercourse or body of water.
6. That the elevation of the proposed sand filters shall be sufficiently high to prevent their operation being interfered with by high water.
7. That whenever required by the State Commissioner of Health the effluent pipe from the sand filters shall be extended to a point below low water mark of the harbor.

NORTH HEMPSTEAD (Rickert-Finlay Realty Co.)

Plans for a sewage disposal plant consisting of a settling tank to treat the **sewage from the** bathing pavilion at the Water Front Park property of the **Rickert-Finlay** Realty Co. at Kensington in the town of North Hempstead **were approved on July 28, 1914**, and under the same date a permit was issued to the company allowing the discharge of effluent from the proposed sewage disposal plant into Manhasset bay. The report on the examination of the plans and the conditions of the permit issued in connection with the approval of them follow:

Plans for the disposal of sewage from the bathing pavilion at the Water Front Park property of the Rickert-Finlay Realty Co. at Kensington in the town of North Hempstead were submitted to this Department for approval on July 16, 1914.

These plans were first submitted for approval on July 9, but a preliminary examination of them showed that they did not contain sufficient data to permit of a final examination of them and they were therefore returned to the designing engineer on July 14. Plans revised in accordance with the requirements of the Department were resubmitted on July 16 as noted above.

Original plans for a comprehensive sewer system and for a sewage disposal plant consisting of a settling tank and sterilization plant to care for the sewage of the realty development of the Rickert-Finlay Co. at Kensington were approved on July 17, 1913. These plans, however, did not include Water Front Park.

According to the report of the designing engineer submitted with the present plans it appears that the ground level of the Water Front Park is considerably lower than the flow line of the settling tank of the main disposal plant and the sewage from the bathing pavilion cannot, therefore, be made tributary to the main disposal plant without pumping. It was stated also by the designing engineer that the nature of the ground was such as to preclude the construction of a subsurface irrigation system, since this park was formed by filling in marsh land with mud, silt and sand dredged from Manhasset bay.

The Water Front Park comprises an area of about 2 acres situated between Shore road and Manhasset bay. It contains tennis courts, summer house, swimming pool, bathing pavilion and two artificial lakes for the use of the residents of the Kensington property of the realty company.

The bathing pavilion for which it is proposed to provide sewerage facilities is to contain 44 dressing rooms, 4 shower baths, 4 lavatories and 4 toilets. The greatest daily capacity of the pavilion is estimated at 100 persons and the maximum flow of sewage at 3,000 gallons per day.

It is proposed to care for the sewage from the bathing pavilion in a sewage disposal plant consisting of a settling tank 10 feet long x 4 feet wide x 5 feet deep. This tank will give a time of detention for the sewage of about 12 hours on the basis used in the design. The clarified sewage from the settling tank is to flow over a weir into a siphon chamber provided with a discharge siphon, by means of which it is to be discharged intermittently to Manhasset bay through a 6-inch pipe laid on a slope of .5 per cent. This pipe is to terminate at a point about 25 feet from shore and in a depth of water of not less than 2 feet at low tide. The point of discharge is about 500 feet above the outlet from the main disposal plant.

The overflow from the two lakes, swimming pool and the shower baths, estimated at 66,000 gallons per day, is to be discharged into an effluent pipe giving a dilution of about 1 in 22. It appears from the plans and the report of the engineer that the point of discharge is about 2,000 feet from the head of Manhasset bay and that a fresh water flow of 7,500 gallons per minute is discharged into it from a mill pond located near the head of the bay.

It is stated in the report of the engineer that owing to the muddy condition of the banks this portion of Manhasset bay is not used for bathing and the artificial swimming pool was, therefore, constructed for the purpose of affording bathing facilities for the residents at Kensington. This bay, moreover, is not suitable for oyster culture as was pointed out to you in my report on the sanitary conditions of Manhasset bay recently transmitted to the Conservation Commission.

In conclusion I would state that it appears from our examination of the plans, after carefully considering the local conditions involved, that the proposed sewage disposal plant, if properly constructed and operated, should satisfactorily care for the sanitary sewage from the bathing pavilion at the

Water Front Park and should produce an effluent which might safely be discharged into Manhasset bay without objection at this time. Conditions may arise, however, in the future which might necessitate the construction of additional or more complete treatment works.

I would, therefore, recommend that the plans be approved and a permit be issued allowing the discharge into Manhasset bay of effluent from the proposed sewage disposal plant on the condition that whenever required by the State Commissioner of Health detailed plans for supplementary or more complete treatment of sewage than that provided for by the present plans shall be submitted for approval and that after the approval of such plans, any or all portions of such supplementary or more complete treatment works shall be constructed and put in operation at the time then specified by the said Commissioner of Health.

ALBANY, N. Y., *July* 21, 1914

PERMIT

A permit, containing the following conditions, was issued to the Rickert-Finlay Realty Co., in connection with the approval of the plans, on July 28, 1914:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary.
2. That the issuance of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.
3. That both the sewers and sewage disposal works shown by plans approved this day shall be fully constructed in complete conformity with such plans or approved amendments thereof.
4. That only sanitary or domestic sewage and no storm water or surface water from streets, roofs or other areas shall be admitted to the proposed sewers.
5. That no sewage sludge from any part of the disposal works shall be discharged into Manhasset bay or in any other watercouse or body of water.
6. That whenever required by the State Commissioner of Health satisfactory detailed plans for additional works for more complete treatment of the sewage or for the sterilization of the sewage for which the works are designed shall be submitted for approval; and upon the approval of said plans any or all portions of such additional or supplementary works for more complete treatment or for sterilization of sewage shall be constructed and put in operation at such time or times thereafter as said Commissioner may designate.

NORTH HEMPSTEAD (Property of Mr. Horace De Lisser)

On August 25, 1914, plans for a sewage disposal plant consisting of a settling tank, dosing tank and subsurface irrigation system to treat the sewage from the property of Mr. Horace De Lisser at Great Neck were approved. The report on the examination of the plans follows.

Plans for sewage disposal for the property of Mr. Horace De Lisser at Great Neck, L. I., in the town of North Hempstead, submitted to this Department for approval on August 4, 1914.

The property which covers an area of about 750 feet in length and from 80 feet to 188 feet in width fronts on Little Neck bay and forms a part of the Grenwolde realty development. Plans for sewerage and sewage disposal for the Grenwolde property were approved by this Department on January 15, 1913. It appears, however, that this portion of the development is located at too low a level to permit of making it tributary to the Grenwolde system by gravity flow and it is therefore proposed to care for the sewage from Mr. De Lisser's property in an independent sewage disposal plant.

According to the report submitted with the plans it appears that the soil on the property except for a strip about 40 feet wide near the shore line is a heavy clay soil underlying a layer of loam from 6 inches to 12 inches deep which makes it impracticable to dispose of the sewage by means of cesspools. The soil at the beach is a coarse sand and gravel.

The average population to be cared for is estimated at 12 persons but the plans are designed for a population of 15. The storm water from the property is to be collected in a separate storm water system discharging into the bay. The sanitary sewage from the garage and residence is to be collected by 4-inch sewers laid with slopes of from 4 to 10 per cent. by means of which the sewage is to be conveyed to a sewage disposal plant located near the water front.

This plant is to consist of a settling tank, dosing chamber and a subsurface irrigation system. The settling tank will be 4 feet wide, 4 feet long and will have a depth below the flow line of 5 feet, giving a capacity of about 600 gallons. This will give a time of detention of the sewage of about 9½ hours.

The sewage is to enter the tank through a submerged inlet and a baffle is to be provided near the outlet end of the tank to prevent scum from floating out over the outlet weir into the dosing chamber. The dosing chamber located adjacent to the settling tank has a capacity of 360 gallons and is to be provided with an automatic discharge siphon of the Miller type by means of which the sewage will be discharged intermittently into the distributing system of the subsurface irrigation field.

This system, which is to cover an area of about .05 of an acre, is to contain 900 feet of 4-inch agricultural tiles, giving about 60 feet of tiles per person. The distributing tiles are to be laid with open joints at a depth of not less than 10 inches below the surface of the ground. The lines of tiles are to be laid on boards in order to give a uniform bearing and the joints are to be protected with tar paper or tin surrounded with coarse sand or gravel.

As noted above the irrigation field will have an area of about .05 of an acre and will be required to operate at the rate of about 30,000 gallons per acre per day, on the basis of design used. This rate is somewhat high for this type of disposal even in a gravelly soil and I am of the opinion that the area should be increased by not less than 50 per cent., which would give a rate of operation of about 20,000 gallons per acre per day. It should not be necessary, however, to provide more than 900 feet of distributing tiling for the enlarged area inasmuch as the lines of tiles could be laid farther apart without decreasing the efficiency of the system.

It is important that great care should be exercised in laying the tiles to protect the joints and prevent the pipes from filling up with sand. The main distributor should consist of vitrified tile piping laid with cement joints and both the main distributor and the laterals should be laid with very slight slopes, say not more than .3 per cent.

In conclusion I would state that it appears from our examination of the plans that the proposed sewage disposal plant, if properly constructed and modified in accordance with the above suggestions, should provide for a satisfactory means of disposal of the sewage and I would, therefore, recommend that the plans be approved on the condition that the area of the subsurface irrigation field be increased by not less than 50 per cent.

ALBANY, N. Y., *August* 21, 1914

NORTH HEMPSTEAD (Property of Mr. Harold Godwin)

Plans for sewage disposal for the property of Mr. Harold Godwin at Roslyn in the town of North Hempstead, Nassau county, were submitted for approval on January 29, 1914, and after an examination of them they were returned to the designing engineer for modifications. Plans revised in accordance with the requirements of this Department were resubmitted for approval on December 2, 1914, and were approved on December 18, 1914.

Plans for sewage disposal for the property of Mr. Harold Godwin located near Roslyn in the town of North Hempstead, Nassau county, were submitted to this Department for approval on October 29, 1914.

The plans were prepared by the Watson Engineering Company of New York city and comprise tracings and blue prints as follows:

1 General plans of the property showing location of the houses with reference to the sewage disposal plant and Hempstead harbor.
2 Detailed plans of settling tank.
3 Detailed plans of filter.
4 Profile through sewer and disposal plant.

According to the report of the designing engineers the property, which consists of two houses having an average combined population of 18, is located on the easterly shore of Hempstead harbor about one mile north of the head of the harbor. The soil on the property consists of a top soil from 6 to 12 inches deep overlying a subsoil of clayey loam with a strip of sand and gravel along the shore about 5 feet wide at high tide. The ground has a slope toward the harbor of about 15 per cent. and the tide at this point has a range of from 6 to 7 feet. The report states that the physical conditions of the property preclude the use of the ordinary subsurface irrigation system for the disposal of sewage.

It appears that the water supply of the property is obtained from a small lake on the property fed by artesian wells and springs and that the sewage from the two houses is at present discharged directly into the harbor. It is now proposed to treat this sewage in a sewage disposal plant consisting of a settling tank, dosing chamber and a so-called intermittent sand filter located near the shore some 300 feet from the houses. The effluent from the plant is to discharge into the harbor below low water. The design of the plant is based on a population of 20 persons and a per capita rate of sewage contribution of 100 gallons per day.

The proposed settling tank, which is to be covered by a reinforced concrete roof, is to be 7 feet long, 5 feet wide and 4½ feet deep, giving an average detention of the sewage of about ½ day on the basis of design used. The tank is to be provided with a submerged inlet and a baffle of reinforced concrete is to be placed about 8 inches in front of the outlet weir. From the settling tank the clarified effluent is to flow over the outlet weir into an adjacent covered dosing chamber which has a capacity of about 390 gallons, equal to a flow of about 6 hours. The chamber is to be provided with a 4-inch discharge siphon having a drawing depth of 17 inches, by means of which it is planned to discharge the effluent intermittently into the distributing system of the proposed filter.

This filter, which is in reality a modified underdrained subsurface irrigation system, is to be excavated in the soil to a depth of about 3 feet. The bottom is shown sloping toward the center line of the filter, along which is to be placed a 6-inch underdrain surrounded and covered with gravel. The filtering material above the gravel and underdrain is to consist of a 24-inch layer of sand having an effective size of .2mm., above which is to be placed a layer of gravel 5 inches deep. The distributing system which is to be laid on top of the filtering material and surrounded with the top layer of gravel, is to consist of a 6-inch main distributor and 5 lines of 3-inch lateral agricultural tiles spaced 5 feet center to center.

The proposed filter is shown with a superficial area of .02 acres and would therefore be required to operate at an average rate of about 100,000 gallons per acre per day. Although this rate would probably be permissible for an open intermittent sand filter the proposed rate is entirely too high for a filter of this type where there is little opportunity for aeration and no facilities for scraping the surface in case of clogging. The filter, if constructed as proposed, should have an area not less than five times as large as the filter shown. It appears, however, that an intermittent sand filter of the size shown would satisfactorily care for the sewage from this property. Such filter might be covered with a small building or with a removable roof provided with vent pipes which could probably be constructed with reasonable economy.

In conclusion I would state that although it appears from our examination of the plans that the proposed sewage disposal plant has been designed to meet the local requirements for sewage disposal, the proposed filter is entirely too small to properly care for the sewage from the property. The filter should either be increased in area or constructed as an open sand filter with provisions for cleaning, inspection and ventilation.

I would therefore recommend that the plans be returned for modification in accordance with the above requirements.

ALBANY, N. Y., *November* 11, 1914

Amended plans for sewage disposal for the property of Mr. Harold Godwin at Roslyn in the town of North Hempstead, Nassau county, were submitted to this Department for approval on December 2, 1914.

These plans were first submitted for approval on January 29, 1914, and were given a careful examination by the Engineering Division. It appeared from this examination that although the proposed sewage disposal plant had been designed in general to meet the local requirements for sewage disposal, the proposed filter, which was a modified underdrained subsurface irrigation system, was too small to properly care for the sewage from the property. The plans were accordingly returned to Mr. Godwin on November 17, 1914, with the recommendation that the area of the filter either be increased or that an intermittent sand filter be substituted for the proposed layout.

The plans now submitted show that they have been revised in accordance with the above recommendation and that an open sand filter has been substituted for the modified subsurface irrigation system shown by the original plan, by removing the top covering of gravel and the tile distributing system and substituting therefor a central distributing trough provided with 8 lateral distributors controlled by adjustable gates. As noted in the previous report the proposed filter has a superficial area of .2 of an acre and when serving a population of 20 persons will be required to operate at the rate of about 100,000 gallons per acre per day. This population, however, appears to be somewhat larger than the average population to be cared for and the average rate of operation, therefore will be smaller than the above stated rate.

In conclusion I would state that it is found from our examination of plans that they have been revised in accordance with the requirements of this Department and that the proposed sewage disposal plant, if properly constructed and if operated with care and efficiency, should satisfactorily care for the sanitary sewage of the Godwin property. If any objectionable odors are created by the operation of the open sand filter or if difficulty from freezing is experienced the filter could readily be covered by a plank roof which should be so placed as to be readily removed for cleaning and inspection of the filter.

In view of the above and after a careful consideration of the essential features of the design and of the local and general requirements for sewage disposal, I would recommend that the plans be approved and a permit issued allowing the discharge into Hempstead harbor of effluent from the proposed sewage disposal plant.

ALBANY, N. Y., *December* 10, 1914

PERMIT

A permit, containing the following conditions, was issued to Mr. Harold Godwin, in connection with the approval of the plans, on December 18, 1914:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary.
2. That the issuance of this permit shall not be deemed to affect in any way action by this Department on any future application that may be

made for permission to discharge additional sewage or effluent into the waters of this State.

3. That both the sewers and sewage disposal works shown by plans approved this day shall be fully constructed in complete conformity with such plans.

4. That only sanitary or domestic sewage and no storm water or surface water from grounds, roofs or other areas shall be admitted to the disposal plant.

5. That no sewage sludge from any part of the disposal works shall be discharged into Hempstead harbor or any other watercourse or body of water.

NORTHPORT

On March 12, 1914, plans for sewerage and sewage disposal for the village of Northport were approved and under the same date a permit was issued allowing the discharge into Northport harbor and a small stream tributary to Long Island Sound of effluent from the proposed sewage disposal plants for the village of Northport. The report on the examination of the plans and the conditions of the permit issued follow.

Plans for a separate system of sewers and for sewage disposal works for the village of Northport, Suffolk county, were submitted to this Department for approval by the board of trustees on February 3, and February 20, 1914. The plans were prepared by Vrooman & Perry, consulting engineers of Gloversville and Amsterdam, and comprise prints of the following:

1. General topographical map of the village showing sewerage and sewage disposal systems.
2. Plan and details of Main street pumping station, district "A".
3. General plan of disposal works, district "A".
4. Grading plan of disposal works, district "A".
5. Profile through disposal works, district "A".
6. Plan and cross section of Imhoff tank, screen chamber and dosing tank, district "A".
7. Plan and cross section of contact beds, district "A".
8. Details of secondary settling tank, hypochlorite plant and sludge bed, district "A".
9. General plan of sewage disposal works, district " B ".
10. Details of sewage disposal works, district " B ", showing Imhoff tank, dosing chambers, sludge beds and sand filters.
11. Profiles of streets and sewers.
12. Details of appurtenances.
13. Alternate general plans of sewage disposal works, district "A".
14. Sheet of construction details, alternate plan for sewage disposal works, district "A".
15. Profile through sewage disposal plant, district "A". (Alternate plan.)
16. Main street pumping station. (Revised plans.)
17. Alternate general plan of sewerage system showing location and arrangement of sewage disposal works, district "A" according to alternate plan, extension of outlet of disposal works, district "A" to low water and containing reference to proposed future disposal works for district " C ".

The report of the engineers states that the proposed system of sewers and sewage disposal works is needed to remove insanitary conditions in the village caused by the present practice of disposing of sewage in cesspools and to eliminate the pollution of the waters of Northport harbor in which oysters are grown and stored now caused by the discharge of sewage from private and semipublic sewers into the harbor. The report states that the village is naturally divided into 3 drainage areas or sewer districts, designated in the plans as districts "A", " B " and " C ". The three areas are to be served by three separate sewer systems and sewage disposal plants. The report of the engineers states that the present population of the village is 2,200, that the present population of district "A" is 1,400, and of district "B" 200. It is stated that district "C" is not built up and in fact the plans show this to be a very small district.

The village of Northport is situated in the northerly part of the town of Huntington on Northport harbor. It is provided with a public water supply derived from driven wells in the southerly portion of the village and the works are controlled by the Northport Water Works Company. The village is not provided with a public sewer system although there are many private sewers and some storm sewers constructed by the village which receive sanitary sewage. It is estimated that there are about 1,600 persons served by sewers in the village, the discharge from which is into Northport bay.

The present population of the village according to the 1910 United States Census report is 2,096, and according to the engineer's estimate is approximately 2,200. The plans indicate that the entire built up section of the village is to be served by the proposed sewer system and the area of this section being about 1,400 acres, the density of population is therefore about 1½ persons per acre. The population of the village has not increased very materially since its incorporation in 1894, the population in 1900 being 1,794, and in 1905 being 1,803.

The plans provide for 3 separate sewer districts with sewage disposal works designed or indicated for each district. The effluent from the plant in district "A" will discharge into the harbor opposite the foot of Washington street. The effluent from the plant in district "B" will discharge into a small stream near the intersection of Waterside and Locust avenues, this stream being tributary to Long Island sound. The plans indicate a proposed pumping station for district "C" at the foot of Cheesebrough road. The sewers tributary to this pumping plant consist of a few hundred feet in Cheesebrough road and Ocean avenue. This district is separated from the village by bold bluffs and there is at present but one residence in the district. It is proposed by the plans to pump the sewage from this district to treatment works to be constructed when required by this Department.

It is not proposed to construct now all of the sewers in district "A" nor the sewers nor sewage disposal works in districts "B" and "C".

According to the report of the designing engineers the population of district "A" is at present 1,400, of district "B", 200, and of district "C", one family. The total of these three estimated populations does not equal the present population of the village and it will therefore be assumed that the populations of districts "B" and "C" have been properly estimated and that the present population of district "A" is between 1,900 and 2,000, since no reference is made to any considerable portion of the village not being provided with sewers as shown by the plans nor does it appear from a comparison with other maps of the district that any of the developed streets are not shown by the sewer plan. The population of district "A" is therefore assumed at 1,900 and with a sewage contribution of 100 gallons per capita daily, the daily flow from this district would be 190,000 gallons. Similarly from district "B" the sewage flow would at present be 20,000 gallons.

District "A" has approximately 900 acres which will now or in the future be tributary to the disposal plant of this district. The population ultimately to be expected on this area will then, even at as low a figure as 10 persons per acre, be 9,000 and this may by reason of unusual development reach 18,000 or more.

In district "B" the area tributary to the disposal plant is shown by the plans as about 400 acres, although the village limits bounding district "B" on the east are not shown and it is not possible to clearly indicate the probable future population which will be tributary to the disposal works in district "B".

The plans have been carefully examined with respect to the sewerage systems and sewage disposal works. In connection with the sewerage systems the design has been carefully studied with reference to alignment, sizes, grades, capacities facilities for cleaning and inspection and flushing, and other features of a hydraulic or sanitary nature. In connection with the means for sewage disposal it has been studied with reference to the general method and efficiency of the sewage disposal plant as a whole and of the capacities and practical operation of the individual structures, appurtenances and apparatus.

The proposed sewers in sewer district "A" vary in size from 8 to 24 inches in diameter and serve practically all of the developed portions of the area. This district comprises the built-up portion of the village bordering on the harbor. The sewers are to be constructed with slopes sufficiently steep to give self-cleansing velocities in them when flowing full or half full. Manholes are to be constructed at all points of change of slope and alignment, at sewer intersections and at intermediate points not exceeding 500 feet apart. Flush tanks are to be installed at the upper ends of lateral sewers. It appears therefore that good facilities for cleaning and flushing and inspection are provided and that the proposed sewers, if properly constructed, should satisfactorily care for the sanitary sewage of the sections to be served by them.

The proposed sewers in districts " B " and " C ", also, appear to be properly designed in respect to the above features.

The greater portion of sewage from district "A", perhaps 95 per cent. is to flow by gravity to this proposed pumping station situated in Main street near the intersection of Woodbine avenue and not far from the water front. The sewage is to be pumped at this point through 1,100 feet of 8-inch force main against a static head of about 25 feet to the manhole on the gravity system in Woodbine avenue leading to the main disposal plant. The pumping equipment is to be housed in a building 6 feet square adjacent to the sump well, and the centrifugal pumps are to be set in a dry chamber below the level of the sewage in the sump well. The pumping station is to be equipped with duplicate, electrically driven and automatically operated, centrifugal pumps, each of which is to be of a rated capacity of 450 gallons per minute. A gas engine and electric current generator are to be installed in the pump house for emergency. With a capacity of 450 gallons per minute each pump will be able to care for a sewage flow from a population of over 3,000 people on the basis of a maximum rate of flow of 200 gallons per capita. The pumps are to be protected by a bar screen located in the sump well. This screen is to be composed of 3/8 inch by 1½ inch bars, spaced 1½ inches in the clear.

It is proposed to treat the sewage collected by the sewer system in district "A" in a sewage disposal plant located near the water front in the southwestern part of the village. Although this site does not appear to be favorably situated with respect to the developed sections of the village the report of the designing engineers states that the proposed site is more advantageous than the other site considered at the foot of Beach street, inasmuch as it is less conspicuous, lends itself more readily to landscape treatment and does not require pumping all of the sewage.

The disposal plant for district "A" shown by the original plans will now be described. This disposal plant is designed to care for a population of 2,000 and is to consist of a screen chamber, Imhoff tanks, 3 primary and 3 secondary contact beds, sterilization plant, secondary settling tank and covered sludge bed. The sewage upon reaching this plant is to be first passed through a small screen chamber provided with a bar screen 6 feet wide, composed of ⅜-inch by 1½-inch bars 4′–9″ long spaced 1⅛ inches in the clear. The chamber is to be covered by a small building about 9 feet by 7 feet in plan.

From the screen chamber the screened sewage is to be passed through a longitudinal, horizontal flow settling tank of the Imhoff type. This tank is 28 feet deep with a depth from the flow line to the bottom of the sludge compartment of 25 feet. It is divided by means of partition walls into 2 upper or settling compartments and 2 lower or sludge compartments. Each of the settling compartments is about 8 feet wide and 30 feet long at the top and about 10 feet deep to the level of the slots. The settling compartments have sufficient capacity to give a detention of 2½ hours of the sewage contributed by a population of 2.000 at a per capita daily rate of 100 gallons. It appears, therefore that the proposed tank is large enough to allow for a considerable increase in population if it is true that the present population of this district, as stated by the designing engineers, is 1,400, but since it is not clear that the population of this district is at present less than 1,900 or 2,000 the plant will probably not be of greater capacity than to care for the present population. Of course it will be some time before all the residences of the district are connected with the sewer system and it would therefore appear that the settling tank has sufficient capacity for the first installation.

The sludge compartment appears to have sufficient capacity to provide for storage facilities for a period of 6 months when serving a population of 1800 persons. Each sludge compartment is provided with an 8-inch sludge pipe extending from the top of the tank to the apex of the sludge compartment, by means of which the sludge is to be removed by gravity flow to a covered sludge tank having an area of about 600 square feet. This tank which is to be underdrained is to be filled to a depth of about 1½ feet with graded gravel ranging from 3 inches to ⅛ of an inch in size. The effluent from the sludge bed is to be passed through a disinfectant plant and then through a secondary settling tank before it is discharged into the harbor. On the basis of 1/3 square foot of sludge drying area per person, which is the usual standard adopted in the design of sludge beds to care for Imhoff tank sludge, the proposed bed should be sufficiently large to care for some 1800 persons.

From the settling tank the clarified effluent is to be discharged into a dosing tank having a capacity of about 1800 cubic feet. This tank is planned with 3 alternate discharge siphons by means of which the sewage is to be applied alternately to each of the 3 proposed primary contact beds from which it is in turn to be discharged by means of timed siphons to 3 secondary contact beds of the same size as the primary beds.

Each of the contact beds is shown to be filled to a depth of about 4 feet with broken stone or screened gravel ranging in size from 1½ inches to 3 inches in the primary beds and from ¾ to 1½ inches for the secondary beds. The distributing system of each bed is to consist of a 10-inch main and 4-inch laterals spaced 6 feet center to center and placed one foot below the surface of the filtering material. The underdrain systems are to consist of 6-inch slotted half-tile spaced 12 inches apart on centers. The underdrains lead to the main collecting drain which runs along the center line of each bed and connects with a timed siphon. It is planned to have each dose from the dosing tank fill the contact beds to within one foot of the top which will give an effective depth of filtering material of about 3 feet for each bed.

The total area of each set of primary and secondary contact beds as planned is about .103 acres. Each set of beds will therefore be required to operate at a rate of 1,360,000 gallons per acre per day when serving a population of 1400 on the basis of a per capita rate of sewage flow of 100 gallons. This is equal to a rate of operation of about 450,000 gallons per acre per day per foot of depth of filtering material. This rate is entirely too high to give satisfactory results for beds of this type which should not be operated at a greater rate than 100,000 gallons per acre per day per foot of depth. The effective depth of filtering material of contact beds should under no condition be less than 4 feet and preferably not less than 5 or 6 feet. Furthermore, as pointed out heretofore in this report, it is not clear that the present population of District "A" is less than 1900 to 2000 and the rate of operation of the contact beds when treating the sewage flow from the present population of this district would be about 40 per cent. higher than the excessive rates stated above.

Before the sewage is discharged into the harbor it is proposed to disinfect it by adding a solution of hypochlorite in quantities equal to about 4 parts of available chlorine per million. The hypochlorite plant is to be covered with a small building in which is to be placed a mixing tank with mechanical stirring devices, 2 solution tanks and 2 constant level orifice tanks. The orifice tanks are planned with valves which are to be actuated by means of baffles in the channels leading from the discharge siphons of the secondary contact beds. It is planned to apply the solution automatically to the effluent as the siphons discharge. The treated sewage is then to be passed through a baffled channel in the disinfectant tank before it is discharged into the secondary settling tank.

This tank is a modified upward and downward flow tank of the Imhoff type and is to be 12 feet in diameter and about 21 feet deep from the flow line to the bottom of the sludge compartment. The settling compartment has a capacity of about 4600 gallons equal to a flow of nearly 1½ hours when treating 84,000 gallons per day. The sludge capacity of the tank is equal to about 600 cubic feet. It is proposed to pump the sludge accumulating in this tank to the sludge bed to be constructed in connection with the primary settling tank. The final effluent from the disposal plant is to be discharged into the harbor at a point about 150 feet from shore.

With reference to the adequacy of the works for sewage treatment proposed by the plans submitted on February 3, to be constructed in District "A", it is evident from the foregoing that whereas the capacity of the settling tank and of the other portions of the plant with the exception of the contact beds is satisfactory, the contact beds are designed to operate at an excessively high rate and the plans therefore, should not be approved.

At this point in our examination of the plans, and in view of the expressed desire of the designing engineer to avoid any possible delay, the question of the inadequacy of the plans for disposal with respect not only to capacity but to method was taken up by me directly with the engineer. It was pointed out that one of the controlling considerations concerning our examination of these plans was with reference to the protection of oyster beds in this harbor. At this particular time, it was also pointed out, the question as to what extent and in what manner this protection should be afforded was under discussion between this Department and the Conservation Commission and, further, that until a policy had been more definitely determined upon in this regard, the temporary position of the Department at this time would be to require as complete purification as was possible. It was finally pointed out that sand filtration was a much more efficient means of purification than contact beds, especially from a bacteriological standpoint, and that even though the policy of the two State departments might ultimately prove such as to sanction the use of contact beds, it would now be possible to approve only of sand filtration as the primary means of purification and that in this latter case no rates greater than 100,000 gallons per acre per day would be approved.

As a result of this interview with the designing engineer alternate plans for sewage treatment works to care for the sewage of District "A" were accordingly submitted for approval on February 20, 1914. The plans for primary treatment works comprise a screen chamber, settling tank, hypochlorite plant and sludge bed shown by the original plans for sewage disposal in district "A" heretofore described in this report and provide for the substitution of intermittent sand filters for the primary and secondary contact beds shown by the original plans. The alternate plans also provide for a modification of the dosing tank and the final settling or detention tank and for the omission of the sludge pump and sludge well, planned to be operated in connection with the final settling tank. Although the proposed sand filters will cover a considerably larger area than the contact beds and will require a filling in of a portion of the Harbor, they will be located at practically the same place as the site of the contact beds.

The supplementary report of the designing engineers states that the proposed location for the sewage disposal plant is the most desirable of the available sites in the village and that any other location would require pumping the sewage through 2 miles of force mains against a head of at least 100 feet. The report also points out that a force main along the shore to a point on Long Island Sound is undesirable inasmuch as it would place the plant about 3 miles from the village and since considerable ledge rock would be encountered.

As noted above alternate plans for sewage disposal in district "A" will now be described. They provide for the retention of the preliminary portions of the sewage disposal plant including the screen chamber, settling tank and sludge bed for the substitution of sand filters for the contact beds and for a modification of the dosing chamber and detention tank.

The proposed dosing chamber is to have a capacity of about 660 gallons which is about 1/3 of the capacity of the original tank and is to be provided with 5 alternating discharge siphons instead of 3 siphons as originally planned. These siphons are designed to discharge alternately to 5 proposed sand filters. Each dose will flood one filter to a depth of about one-half inch.

The filtering material of the sand filters is to consist of 3½ feet of sand having an effective size of not less than .22 and not more than .37 mm. with a uniformity coefficient of not more than 3. Below the filtering material is to be placed a 3" layer of sand and gravel with a bottom layer of screened gravel 3" deep surrounding the underdrains. The bottom of the filters will be at an elevation of about 3 feet above mean high tide and their operation should therefore not be interfered with from back water. The distributing system of the filters is to consist of troughs having concrete bases and wooden sides with adjustable gates for controlling and regulating the effluent.

The filters have a combined area of about 1.5 acres and with an assumed sewage contribution of 100 gallons per capita daily and a rate of operation of these filters of 100,000 gallons per acre per day they should satisfactorily care for the sewage from the population of 1500 persons. It is possible that with strict compliance with the careful specifications for the material of which these filters are to be composed a rate of operation can be allowed somewhat greater than 100,000 gallons per acre per day. Furthermore, it is probable that the maximum population of this district will occur in the summer season when the conditions are more favorable than at other times for successful operation of the filters at maximum rates. It is probable therefore that the proposed filter beds to be constructed at present will satisfactorily care for the present population in this district even if, as seems probable, it is more than 1500 persons, but it should be stated that any material increase of the population of the district will require an extension of the sand filter beds. The plans provide for the doubling of the sand filter area so that with a duplication of the preliminary works shown by the plans and the construction of the additional sand filters shown, the plant will care for a future population of 3000 to 4000 persons.

It is proposed to treat the sand filter effluent with hypochlorite before it is discharged into the harbor. No statement is made however, as to the amount of hypochlorite to be used. I am of the opinion that not less than 5 parts of available chlorine per million parts of sewage treated should be used. After adding the hypochlorite the treated effluent is to be passed through a detention tank having a capacity of about 6900 gallons equal to about one hour's flow of sewage.

The final effluent is to be discharged into the harbor at a point about 800 feet from the shore in order to carry the effluent past the shallower portions at the head of the harbor. It is usually most desirable to have the outlet pipes from disposal plants entirely submerged at all times and I would recommend that the proposed outlet pipe be extended out into deeper water in the harbor, if, after the construction of the plant, any undesirable conditions are found to arise from the discharge of the effluent at the point shown by the plans.

It is found from our careful examination of the alternate plans that the proposed sewage disposal plant for district "A" shown by them if properly constructed and if operated with care and efficiency should produce a satisfactory effluent which may, in my opinion, be safely discharged into Northport harbor without objection. It would be desirable however, to change the location of the proposed sand filter so that no portion of it shall be less than 100 feet from the highway.

According to the supplemental report accompanying the alternate plans sand filters will cost some $13,600 more than the contact beds as originally planned. It must be noted, however, in this connection that the proposed contact beds are entirely too small to operate satisfactorily under ordinary conditions and that primary and secondary contact beds of proper size would probably cost as much if not more than sand filters.

The sewage from Sewer District " B " is to be conveyed by gravity flow to the sewage disposal plant consisting of a screen chamber, Imhoff tank, four sand filters and auxiliary sludge bed to be located near a small stream in the northeastern part of the village tributary to Long Island Sound. This stream has a drainage area of not more than one square mile at the disposal plant site.

The proposed screen chamber, which is to be located adjacent to the inlet end of the settling tank, is to be 6 ft. by 5 ft. by 3 ft. deep inside dimensions and is to contain a bar screen 6 ft. wide composed of ⅜ by 1⅛-inch bars 3 ft. 4 in. long and spaced 2 inches on centers. The screened sewage is to flow from the screen chamber to a proposed settling tank of the horizontal flow type. This tank is to be 17½ ft. deep below the flow line and is to contain one settling compartment and one sludge compartment.

The settling compartment will give a time of detention of nearly 8 hours when serving the present population of 200 persons and 3 hours' detention when serving a population of 500 on the usual assumptions as to sewage contribution. The sludge compartment has a capacity of nearly 450 cubic feet and should be adequate to care for a population of some 500. The sludge is to be removed from the settling tank by gravity and discharged on the covered sludge drying bed having an area of 400 square feet.

From the settling tank the clarified sewage is to flow into two dosing chambers provided with automatic discharge siphons by means of which the sewage is to be discharged into a gate chamber located in the center of the sand filter area. Details of the gate chamber are not shown but it appears to be so arranged as to permit of operating the different beds alternately. The sand filters are to be 3 feet deep and will have an area of nearly .2 of an acre. They will therefore be required to operate at a rate of about 100,000 gallons per acre per day when serving the present population of 200, which rate should not be exceeded. It appears, therefore, that although the preliminary portions of this disposal plant will care for some 500 persons the sand filters will not care for more than 200 people. The plans show, however, that it will be possible to extend the sand filters by the construction of four additional beds of the same size as those shown by the detailed plans.

It is evident that the flow in the stream into which the effluent from this plant is to be discharged is likely to be too small to properly dilute the effluent from the plant at all times owing to the limited drainage area of the stream. Another condition unfavorable to the successful use of this stream as a means of carrying off the effluent from this plant is the fact that it flows through a considerable area of low, swampy land before reaching Long Island Sound, which is about three-quarters of a mile from the disposal plant. Provisions should be made in the permit when issued that the effluent sewer from this plant shall be extended to the Sound should it be found that any condition of nuisance is created in the small stream when the plant is put in operation. It would also seem necessary to include in the permit provision that the effluent from this plant shall be sterilized when required by this Department in accordance with plans satisfactory to the Department.

According to the report of the Designing Engineers Sewer District " C " comprises practically but one estate and the only residence in the district is over a mile from the main portion of the village. The plans show a proposed sewer in Cheesebrough Road leading to a small pumping plant at the foot of the street and a note on the plans states that the sewage from this district is to be pumped to treatment works to be constructed when required by the State Department of Health. The engineers' report states that such works should consist of a settling tank and subsurface irrigation system. Neither details of this disposal plant nor its location are shown by the plans and it would seem that the permit when issued should require that the sewers in District " C " shall not be constructed nor put in operation until satisfactory detailed plans for sewage disposal works are submitted to and approved by this Department; and, further, that such sewage disposal works shall be constructed before any sewage is admitted to the proposed sewers.

In view of the foregoing I beg to recommend that the plans for sewerage and sewage disposal for Districts "A," "B" and "C" be approved as originally presented with the exception that only the plans for sewage disposal in District "A" designated as "Alternate Plans," i. e., the plans comprising Imhoff tanks, sand filters and sterilization plant, be approved; and that the permit issued contain in addition to the usual revocation, construction and maintenance clauses, provisions to the effect:

1. That additions and alterations in the sewage disposal works and in the methods of operating them be made whenever required by the State Commissioner of Health.
2. That the amount of available chlorine to be added to the effluent from the sand filters at the disposal plant in District "A" shall be not less than five parts per million.
3. That the effluent pipe from the disposal works in District "A" be extended to deep water whenever required by the State Commissioner of Health.
4. That the effluent pipe from the disposal works in District "B" be extended into Long Island Sound whenever required by the State Commissioner of Health.
5. That provision be made and works constructed for sterilization of the effluent from the sand filters to be constructed in District "B" whenever required by this Department.
6. That plans for sewage disposal in District "C" be prepared and submitted for approval and these works constructed before the sewers to be constructed in District "C" are put in operation.

In conclusion I would suggest that the attention of the Village Trustees be called to the fact that whenever by any provision of law the consent or approval of any State board, officer or commission is required for the construction of any sewer system or sewage disposal works, the further approval thereof by the Conservation Commission shall be required. The village officials should also be reminded of the provision of the Village Law which requires that special application should be made to this Department for approval by the Commissioner of any proposition to temporarily defer the construction of a portion of the permanent general system of sewerage and sewage disposal for the village.

ALBANY, N. Y., *March* 3, 1914

PERMIT

A permit, containing the following conditions, was issued to the Board of Trustees of the village on March 12, 1914:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary.
2. That the issuance of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.
3. That both the sewer system and the sewage disposal works shown by plans approved this day shall be fully constructed in complete conformity with such plans or approved amendments thereof.
4. That only sanitary or domestic sewage, and no storm water or surface water from streets, roofs or other areas shall be admitted to the proposed sewers.
5. That no sewage sludge from any part of the disposal works shall be discharged into Northport Harbor, Long Island Sound or any body of water or watercourse connecting with, or tributary thereto.
6. That whenever notified by the State Commissioner of Health, the village shall make such additions or alterations to any or all parts of the sewage disposal works, or such changes or modifications in the method of operating them as said Commissioner may require.

7. That chlorine gas or hypochlorite of lime shall be continuously applied in the proportion of five parts per million of available chlorine to disinfect the effluent from the sewage disposal works in District "A."

8. That whenever required by the State Commissioner of Health the effluent pipe from the sewage disposal works in District "A" shall be extended to such points as he may require or approve.

9. That whenever required by the State Commissioner of Health the effluent pipe from the sewage disposal works for District "B" shall be extended to Long Island Sound in accordance with plans approved by this Department.

10. That whenever required by the State Commissioner of Health satisfactory plans for sterilization of the effluent from the sand filters in Sewer District "B" shall be submitted to this Department for approval; and that said works shall be constructed and put in operation within the time limit then specified.

11. That before any sewage is discharged into the proposed sewers in District "C," sewage disposal works to treat the sewage from this district shall be constructed in accordance with plans approved by this Department.

OGDENSBURG

On September 30, 1914, plans for proposed sewers in the northwestern porion of the city of Ogdensburg were approved. The report on the examination f the plans and the conditions of the permit issued follow:

Plans for proposed sewers in the northwestern portion of the city of gdensburg, St. Lawrence county, were submitted to this Department for pproval by the board of public works on September 10, 1914.

The records of the Department show that plans for proposed sewers in he northwestern part of the city west of Jefferson avenue and north of Spring treet with a new outlet into the St. Lawrence river at the foot of Madison venue extended were submitted for approval on August 8, 1913. Our xamination of these plans shows that all the existing public sewers west of he Oswegatchie river discharge into the Oswegatchie river or tributaries hereto. It appeared also that owing to the formation of the shore line in he western section of the city it was very possible that any sewage disharged into the St. Lawrence river west of the Oswegatchie river would, nder certain conditions of wind and eddies, be carried to the intake of the ublic water supply which is taken from the St. Lawrence river at a point a ew hundred feet west of the westerly city line, and inasmuch as the outlet f the proposed sewers would be at a point about 1,500 feet from the intake, t was deemed advisable not to approve the plans for the proposed sewers. hey were accordingly returned to the city engineers without the approval of he Department on September 9, 1913.

It was pointed out in the report on the examination of the plans that it ppeared to be possible to care for the sewage in this section of the city ither by pumping the sewage collected by the proposed sewers into the ravity portion of the existing sewer system tributary to the Oswegatchie iver, or by constructing a marginal intercepting sewer along the St. Lawrence iver discharging into the Oswegatchie river, which would care for all of the ewage in the northwestern part of the city. A subsequent inspection of he local conditions made by a representative of this Department at the reuest of the city officials confirmed the position of the Department and howed that although it might require considerable deep cutting through ard pan and boulders it would be possible to construct a marginal sewer long streets parallel to the St. Lawrence river discharging into the Osweatchie. It was also found that a trunk sewer was contemplated in Covingon street east of Albany avenue which was to discharge into the Oswegatchie iver. and that this sewer could undoubtedly be extended or made a part of marginal intercepting sewer.

The plans now submitted and under consideration show that the recommendations of this Department have been carried out and provide for a trunk sewer extending from a point in Monroe avenue just north of Spring street through Monroe avenue to Pearl street, and in Pearl and Covington streets discharging into the Oswegatchie river between Covington and Ferry streets extended. The lower portion of this sewer east of Albany avenue is to be 34 inches in diameter and the remainder of the sewer is to be a 24-inch sewer. The plans also provide for a number of lateral sewers in Madison, Main and Adams streets and Rensselaer avenue. The plans also show a 24-inch sewer in Albany street tributary to the proposed outfall sewer to be constructed for the purpose of relieving the existing sewer in Main street. The proposed trunk sewer will also intercept a small surface stream which discharges into the St. Lawrence river near the water supply intake. All of the sewers are to be constructed with slopes sufficiently steep to provide self-cleansing velocities in them under ordinary conditions.

According to the plans and the report of the designing engineer, about 1,600 feet of the lower end of the proposed trunk sewer will be at or below the water level of the river. The report of the city engineer states that it is proposed to construct this portion of the sewer of ⅜-inch steel pipe 36 inches in diameter with sleeve connections, and that the pipe is to be lined with Portland cement mortar retained with steel laths so as to leave a net inside diameter of 34 inches. The remainder of the sewer is to be constructed of vitrified tile pipe.

Whereas this is essentially a constructive feature concerning which this Department cannot attempt to advise, it would seem that the difficulty of constructing this pipe in the manner suggested and the comparatively high cost of it might make it a less desirable type of conduit than double strength vitrified tile pipe with joints made with G. K. Compound or Jointite or some other waterproof joint material. Furthermore the tile pipe would give better facility for making house connections than would the steel pipe with cement lining. The question, however, is a constructive one and no doubt either type of pipe construction should give satisfactory results if properly laid.

I would recommend that the plans be approved and a permit be issued allowing the discharge into the Oswegatchie river of the sewage to be collected by the proposed sewers and that the permit contain in addition to the usual revocation and modification clauses the condition that whenever required by the State Commissioner of Health plans for the interception and treatment of the entire sanitary or dry weather flow of sewage of the city be submitted to this Department for approval.

ALBANY, N. Y., *September* 23, 1914

PERMIT

A permit containing the following conditions was issued to the board of public works of Ogdensburg in connection with the approval of these plans on September 30, 1914:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary.
2. That the issuance of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.
3. That whenever required by the State Commissioner of Health, satisfactory detailed plans for the interception and treatment of the entire sanitary or dry weather flow sewage of the city shall be prepared and submitted to this Department for approval; and that within the time limit stated in such requirement the construction of any or all works shown by such plans as may be then specified shall be completed and put in operation.

OLD FORGE

On January 17, 1914, amended plans for sewerage and sewage disposal providing for the substitution of Imhoff tanks for septic tanks and for a change of location of the main disposal plant at the village of Old Forge were submitted for approval. These plans were approved on June 27, 1914. The report on the examination of the plans and the conditions of the permit issued in connection with the approval of them follow:

Amended plans for sewerage and sewage disposal of the village of Old Forge, Herkimer county, were submitted to this Department for approval on June 17, 1914.

Original plans for a sanitary sewer system for the village and for two sewage disposal plants consisting of septic tanks and contact beds were approved on June 26, 1911. One of these was to serve the main portion of the village and was to be located near the foot of Harrison street, the other for the Old Forge House and the Eagle Bay Road District was to be located near the hotel. Although the permanent winter population of the village was about 500 in 1910 the sewerage and sewage disposal systems were designed to care for a summer population of 1,000 persons. It was estimated that of this population 750 would be tributary to the main sewage disposal plant and 250 to the small plant.

The plans now under consideration were first submitted for approval on June 4, 1914, and showed that it was proposed to substitute Imhoff tanks for the proposed septic tanks at both plants and that it was proposed to change the location of the main disposal plant from a point near the foot of Harrison street to a site near the intersection of Sheard and Garnon streets. It is stated by the village officials that the proposed change of location of the main disposal plant is desired inasmuch as it would obviate the necessity of constructing a long outfall sewer through an undeveloped section and since no houses are connected with the Harrison street sewer below Sheard street the entire sewage of the village can be conveyed by gravity flow to the new disposal plant.

It was not clear from the plans as first presented, however, that all of the sewage tributary to the Harrison street sewer would be intercepted and conveyed to the disposal plant. The plans were otherwise defective and lacked sufficient details to permit of a final examination of them. They were, therefore, returned to the designing engineer with the recommendation that they be modified in the following respects:

1. That the temporary effluent pipes from the Imhoff tanks to the river be shown on both general and detail plans.
2. That sections through the screen chamber inlet channels, longitudinal sections through the Imhoff tanks and profiles of the temporary effluent pipes giving elevations and major dimensions of the different sections be shown, in other words, a continuous profile of the disposal plant from inlet to outlet should be shown.
3. That the flow lines of the settling tanks and the elevations of the same, together with dimensions and elevations of the different parts of the tank be given on the cross sections shown by the plans.
4. That the elevations of the different portions of the sludge bed to be constructed in connection with the proposed plant near the intersection of Sheard and Garnon streets be shown and that the beds be lowered somewhat if practicable in order to give a greater hydraulic gradient or operating head to the sludge pipe.
5. That the elevation of the surface of the stones in the larger contact bed be shown.

It was also pointed out that the capacity of the sludge chamber of the larger settling tank was too small and should be increased considerably. Our examination of the revised plans shows that they have been revised in general accordance with all of the above recommendations. The double flush tank in Harrison street below Sheard street is to be replaced by a single flush tank, the connection of the existing sewer in Harrison street is to be discontinued below Sheard street and the 8-inch sewer shown on the plans first submitted extending from the double flush tank to the existing sewer in Harrison street has been omitted as required. From our examination of the plans it appears that the proposed sewers if properly constructed should be adequate as to size and capacity to satisfactorily care for the sanitary sewage of the village.

The sewage upon reaching the sewage disposal plants is first to be passed through small screen chambers provided with bar screens composed of bars spaced two inches from center to center. From the screen chambers the sewage is to flow through open channels to the proposed settling tanks, which are to be horizontal longitudinal flow tanks of the Imhoff type.

The larger settling tank of the main disposal plant is to be 15 feet in diameter, 19 feet deep and is to be divided by means of wooden partitions into a single upper settling compartment and a lower cone-shaped sludge compartment. The settling compartment will give a time of detention of about 2¼ hours when serving the summer population and a detention of about 3⅓ hours for winter conditions on the usual assumption as to per capita rates of sewage contribution.

The sludge compartment will have a capacity of about 590 cubic feet and the sludge is to be removed from it by means of an 8-inch cast-iron pipe and discharged by gravity flow to an adjacent sludge bed. The hydraulic gradient of the sludge pipe will be about 13 per cent. The sludge bed is to be 10′ x 20′ and is to be underdrained and filled to a depth of 17 inches with graded broken stone having a maximum size of 2½ inches around the underdrains. Above the broken stone is to be placed a 1½-inch layer of sand. The effluent from the sludge bed is to be discharged directly into the Moose river. The proposed contact bed is to be divided into 4 units filled to a depth of 4½ feet with broken stone ranging in size from ½ inch to 2 inches. Although not shown in detail by the plans, it appears that the sewage is to be applied to the beds by means of Adams sewage feeds and the discharge from the beds is to be controlled by timed siphons of the Miller type. The total area of the contact beds of the main plant is equal to about .2 of an acre and will therefore be operated at the rate of about 375,000 gallons per acre per day during the summer on the basis of design used.

The proposed sewage disposal plant for the hotel district is similar in design to the main plant. The Imhoff tank, which is 12 feet in diameter and about 18 feet deep, will provide for a time of detention of about 4 hours. The sludge bed is to be 10 feet by 16 feet and should be of adequate size to care for a population of nearly 400 persons.

The contact beds of the plant, which are to be about 4 feet deep, will have an area of about .065 acres and will be required to operate at the rate of about 300,000 gallons per acre per day when serving a population of 250 persons. These contact beds are also to be provided with Adams sewage feeds and timed discharge siphons.

The detailed plans also show by dotted lines an additional settling tank and sludge bed at each of the two disposal plants, but do not provide for the future extension of the contact beds. It will probably be a considerable time in the future before it will become necessary to extend either the preliminary or the supplementary treatment works at either plant. Whenever it becomes necessary to extend any portion of these works details for such extensions should be submitted for approval.

Although it appears from the conference held in this office with the village clerk on April 16, 1914. that the village desires to temporarily omit the construction of the contact beds at both plants, no formal application asking for the omission from construction of these structures as required by the Village Law has so far been received. The village clerk has, however, been twice notified of this provision of the Village Law. The plans provide for outlets from both the settling tanks and contact beds at both plants. The permit issued in connection with the plans as presented would provide for the construction of the entire plants and would preclude the discharge of effluent from the settling tanks unless an application for the temporary omission of the contact beds is submitted and approved.

In conclusion I would state that it appears from our examination of the plans that the sewage disposal plant, if properly constructed and if carefully operated, should produce an effluent which might be discharged into Moose river without objection at this time. I would, therefore, recommend that the plans be approved and a permit issued allowing the discharge into the Moose river of effluent from the proposed sewage disposal plants at points shown on the plans.

ALBANY, N. Y., *June* 22, 1914

PERMIT

A permit containing the following conditions was issued in connection with the approval of these plans on June 27, 1914.

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary.
2. That the issuance of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.
3. That both the sewer system and the sewage disposal works shown by plans approved this day shall be fully constructed in complete conformity with such plans or approved amendments thereof.
4. That only sanitary or domestic sewage and no storm water or surface water from streets, roofs or other areas shall be admitted to the proposed sewers.
5. That no sewage sludge from any part of either disposal works shall be discharged into the Moose river or any other watercourse.

OLEAN

Plans for proposed sewer extensions in Kittanning avenue and the East River road in the city of Olean were approved on June 30, 1914, on condition that whenever required by this Department satisfactory plans for the interception and disposal of the entire sanitary sewage of the city shall be submitted for approval. The report on the examination of the plans and the conditions of the permit issued, follows:

A single set of plans for proposed sewer extensions in the city of Olean, was submitted to this Department on June 5, 1914. A duplicate set of the plans submitted in accordance with the requirements of this Department and at your request, was received on June 22, 1914, and an application for the approval of the plans and the issuance of a permit was received on June 25, 1914.

The city of Olean, which had a population of 14,748 in 1910, is situated in the southeastern part of Cattaraugus county at the confluence of the Allegheny river and Olean creek. The river which receives the greater portion of the sewage of the city at this time has a drainage area at this point of about 1,000 square miles.

The records of this Department show that a large portion of the sewer system which receives both storm water and sanitary sewage was constructed from 1892 to 1894 apparently without the approval of this Department. Plans for sewerage and sewage disposal for the village of North Olean now comprising the seventh ward of the city were approved in 1907, and plans for a sanitary sewer system in the eighth ward of the city formerly known as Boardmanville and East Olean were approved on June 4 1909. The permit issued in connection with the approval of these 1 plans contains in addition to the usual revocation and modification clauses the following condition:

That whenever required by the State Commissioner of Health complete plans satisfactory to this Department for the separation and treatment of the entire sanitary sewage of the city shall be prepared and submitted to this Department for approval and that within the time then specified the construction of any or all works shown by said plans as may be stipulated. shall be completed.

The plans now submitted and under consideraion show that it is proposed to construct comparatively short sewer extensions in Kittanning avenue and East River road with an outlet discharging into the Allegheny river near the mouth of Pratts brook. According to the plans the greater portion of the sewer in Kittanning avenue together with the outlet sewer is to be constructed at once but the construction of the remainder of the sewer in Kittanning avenue and the East River road sewer is to be deferred until some time in the future.

The proposed sewer in Kittanning avenue is to be 1,485 feet long and is to be constructed of 10-inch vitrified pipe laid on slopes of from 1.33 per cent. to 10 per cent. East River road sewer is also to be a 10-inch sewer with a slope of .4 per cent. and will have a total length of 1,135 feet. The outlet sewer is to consist of 400 feet of 15-inch sewer laid on a slope of from 2 to 4 per cent.

Except for two sections of the Kittanning avenue sewer and the upper end of the outfall sewer, all the sewers are to be provided with manholes at all points of change of slope and alignment. The upper section of the Kittanning avenue sewer is shown with a change of slope from 4 to 10 per cent. and a change of alignment near the West River road without manholes at these points. A change of slope of from 2 to 4 per cent. is shown on the outfall sewer with no manholes at the change of slope. Manholes should be placed at all changes of slope and alignment or the sewers should be made straight between adjacent manholes in order to facilitate cleaning and inspection.

A portion of the outfall sewer and the Kittanning avenue sewer are located above and comparatively close to the pumping station and one of the wells from which the city derives a portion of its water supply. Any leakage from these sewers near the well would be liable to contaminate the well water. The outfall sewer and the Kittanning avenue sewer between the outfall sewer and the East River road should therefore be constructed of cast-iron pipe with lead joints in order to prevent leakage.

From a careful examination of the plans it appears that the proposed sewers if modified in accordance with the above suggestions and if properly constructed should satisfactorily meet the future needs for sewerage for the sections to be served by them. It appears also that the proposed sewers are to be located at a sufficiently high elevation to permit of carrying the sewage across the Allegheny river either by an inverted siphon or on the Union Street bridge should it in the future become desirable to collect the entire sewage of the village to one point for disposal.

I would, therefore, recommend that the plans be approved and a permit be issued allowing the discharge into the Allegheny river of sewage from the proposed sewers and would further recommend that the permit contain in addition to the usual revocation and modification clauses the same condition with reference to the future treatment of the sewage of the city as is contained in the permit issued in connection with the approval of plans for the proposed sewer system in the Boardmanville and East Olean sewer districts, on June 4, 1909.

ALBANY, N. Y., *June* 25, 1914

PERMIT

A permit, containing the following conditions, was issued in connection with the approval of the plans on June 30, 1914.

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary.
2. That the issuance of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.
3. That only sanitary or domestic sewage and no storm water or surface water from streets, roofs or other areas shall be admitted to the proposed sewer.
4. That manholes shall be constructed at all changes of slope or alignment of the sewer or the sewer shall be so constructed as to be straight between manholes.
5. That the outfall sewer and the sewer in Kittanning avenue between the outfall sewer and the East River road shall be constructed of cast-iron pipe with lead joints.
6. That whenever required by this Department satisfactory detailed plans for intercepting and outfall sewers to convey the entire sanitary sewage of the city of Olean to a suitable site or sites for sewage disposal works, together with detailed plans for sewage disposal works to treat the entire sanitary sewage of the city shall be submitted to this Department for approval; and upon approval of such plans any or all portions of the intercepting and outfall sewers and of the sewage disposal works shall thereafter be constructed whenever required by the State Commissioner of Health.

ONEIDA

Under date of March 26, 1914, an application was received from the Board of Public Works of the City of Oneida asking for permission to temporarily omit from construction the sprinkling filters forming a portion of the sewage disposal works of the city on the grounds that the city was not financially able to construct the entire works as provided for by the plans approved by this Department on November 10, 1913, and stating that the granting of such application would make it possible for the city to proceed with the construction of the intercepting sewer, pumping station and Imhoff tanks. After careful consideration a permit containing the following conditions and superseding the permit issued on November 10, 1913, was granted on April 20, 1914:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary.
2. That the issuance of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.
3. That both the sewer extensions and the sewage disposal works shown by plans approved on November 10, 1913, with the exception of the sprinkling filters, shall be fully constructed in complete conformity with such plans or approved amendments thereof.
4. That the construction of the said sprinkling filters may be temporarily deferred but that these filters shall be constructed and put in operation by November 1, 1915.
5. That this permit shall be revocable on November 1, 1915, unless the sprinkling filters shall be constructed and put in operation on or before such time.
6. That only sanitary or domestic sewage and no storm water or surface water from streets, roofs or other areas shall be admitted to the proposed sewers or to the sewage disposal works.

7. That before the proposed sewage disposal plant is constructed and put in operation, effective steps shall be taken by the city to exclude from the city sewer system all unpolluted circulation or cooling water and to prevent excessive infiltration of ground water into the city sewers.

8. That no sewage sludge from any part of the disposal works shall be discharged into Oneida creek or any other watercourse.

9. That this permit shall supersede the permit issued by this Department on November 10, 1913.

ONEIDA COMMUNITY

On February 24, 1914, plans for sewerage and sewage disposal for Oneida Community, Ltd., covering the unincorporated villages of Kenwood and Sherrill in Madison and Oneida counties, were submitted for approval. These plans were not in satisfactory condition for approval and were therefore returned to the designing engineers for modifications. Plans revised in accordance with the requirements of this Department and providing for a sanitary sewer system and sewage disposal works consisting of a pumping station, settling tanks of the Imhoff type, dosing chamber, sprinkling filter and final settling tank to treat the sewage from the Oneida Community were submitted for approval on May 1, 1914, and were approved on May 21, 1914. The reports on the examination of the plans and the conditions of the permit issued in connection with the approval of them are given below.

Plans for a separate system of sewers and for sewage disposal works for the Oneida Community, Ltd., covering the unincorporated villages of Kenwood and Sherrill in Madison and Oneida counties, were submitted to this Department for approval by H. V. Noyes on behalf of the Oneida Community, Ltd., on February 24, 1914.

The plans were prepared by C. W. Knight & Son, civil engineers of Rome and comprise duplicate copies of blue prints of the following:

1 Topographical map showing proposed sewer system of Kenwood.
2 Topographical map showing proposed sewer system of Sherrill.
3 Five sheets of profiles of sewers of Sherrill and Kenwood.
4 Details of appurtenances (one sheet).
5 Thirteen sheets showing general plan and details of sewage disposal works.

One copy of the designing engineer's report and duplicate copies of specifications were also received.

The report of the engineers and the letter transmitting the plans and application for the approval of the plans state that the hamlets of Sherrill and Kenwood are populated almost entirely by people employed by the Oneida Community, Ltd., or connected with them in some way and that so far all the sewerage and water supply construction have been done by the corporation with the intention of turning both the existing and proposed works over to the village in the near future when these places are incorporated. The report also states that the proposed sewers cover every street in Kenwood and Sherrill upon which residences front or will front, and that the area proposed to be included within this system for the present and future is shown by the plans.

The two settlements are located in two different counties and two different municipalities. Sherrill is in the town of Vernon, Oneida county, and the hamlet of Kenwood lies partly in the town of Vernon, Oneida county, and partly in the city of Oneida, Madison county. Kenwood is located on Oneida creek, and Sherrill is on Sconandoa creek, a tributary of Oneida creek. It appears that although Kenwood has no water supply and no sewers except storm sewers, Sherrill has a number of private and semipublic sewers serving the school house, club house, the trap factory, the tableware works and a few private residences discharging into Sconandoa creek.

The present population of the two villages according to the report of the designing engineers is approximately 1,200, and the areas to be served by the proposed sewers comprise about 280 acres, giving a density of about 4 per acre. Based on a density of 15 persons per acre it is estimated that the population ultimately to contribute sewage from the sewer districts will be approximately 4,200. The design of the sewerage and sewage disposal systems is based on a future population of 5,000 persons, and a maximum per capita rate of water consumption of 100 gallons per day.

The plans have been carefully examined with respect to the sewerage system and sewage disposal works. In connection with the sewerage system the design has been carefully studied with reference to alignments, sizes, grades, capacities, facilities for cleaning and inspection and flushing and other features of a hydraulic or sanitary nature. In connection with means for sewage disposal it has been studied with reference to general method and efficiency of the sewage disposal plant as a whole, and of the capacities, and practical operation of the individual structures, appurtenances and apparatus.

In general the sewage from the hamlet of Sherrill is to be conveyed to the Kenwood system through a 12-inch sewer in Sherrill road and the sewage of the two communities is to be carried through a 15-inch sewer to the disposal works, located on Oneida creek, about 1,000 feet below the developed section of Kenwood. The proposed sewers comprising these systems vary in size from 6 inches to 15 inches in diameter and although many of them are to be laid on minimum slopes it appears that the proposed slopes are sufficiently steep to give self-cleansing velocities in the sewers when flowing full and half full. There appears to be a discrepancy in the plans in that the general sewer map of Kenwood and the profiles show a 15 inch outlet sewer with a .15 per cent. slope, while the map of the outfall sewer and sewage disposal works shows this sewer with a slope of .2 per cent.

Flush tanks are to be installed at the upper ends of lateral sewers having low slopes in order to aid in flushing such sewers. Manholes are provided at each change of slope and alignment and at sewer intersections, and the sewers are to be laid with sraight alignments between manholes. The spacing of the manholes, however, is excessive in may cases. The distances between adjacent manholes on approximately one-half of the sewers in Kenwood are more than 500 feet. In Hamilton avenue is shown a section of an 8-inch sewer, 80,665 feet long with no intermediate manhole, and the last section of the 15-inch sewer leading to the disposal plant is 925 feet. In a few cases both in Kenwood and Sherrill sections of sewers from 700 to 1,000 feet between adjacent manholes are provided with intermediate lampholes. Although these long sections of sewers are not designed with minimum slopes, I am of the opinion that lampholes are not adequate substitutes for manholes on such long sections of sewers, and that the spacing of manholes should not be greater than 400 feet, and in no case should distances between adjacent manholes on small size sewers exceed 500 feet.

Two inverted siphons are planned to carry the sewage under Oneida creek. One of these siphons is to carry the sewage from a factory located in the southwestern portion of Kenwood across the creek to a proposed 8-inch sewer. This siphon is to be a single tube siphon consisting of 100 feet of 6-inch cast-iron pipe. The pipe is to be laid on a slope of 1 per cent. and the difference of elevation between the inverts of the sewer at the manholes above and below the siphon is about one foot, giving a hydraulic gradient of nearly 1 per cent. through the siphon. The carrying capacity of the siphon is nearly equal to the capacity of the 8-inch sewer below it. Although it is usually advisable to construct all inverted siphons with double tubes, I am of the opinion that inasmuch as it is in effect only a private connection and will probably have a large continuous flow, and, in view of the short length of this siphon, that it would be permissible to use only one line of pipe across the creek in this case. It might be better, however, to pump the sewage from this factory across the creek.

The second siphon referred to is 300 feet long and is to carry the sewage from Sherrill and the greater portion of Kenwood across Oneida creek to proposed outfall sewer leading to the disposal works. This siphon is pl with one 8-inch line and one 6-inch line of cast-iron pipe laid on .34 per cent. slopes. The difference of elevation between the inverts of the sewer above and below the siphon is 1.73 feet, giving a hydraulic gradient of about .5 per cent. The inlet end of the 8-inch pipe of the siphon is provided with a flap valve, back of which is an 8-inch riser pipe which extends from a tee on the siphon line to an elevation of 6 inches above the invert end of the inlet sewer, discharging into the siphon manhole so that the 8-inch line will be thrown into operation automatically when the sewage backs up in the manhole to an elevation of 6 inches or more above the invert of the inlet sewer.

The upper manhole of this siphon is also provided with a 12-inch emergency overflow leading to Oneida creek, which would come into operation when the sewage for any reason backs up in the manhole one foot or more above the invert of the inlet sewer. It should not be necessary, however, to provide overflows for double-tube siphons, inasmuch as both lines will probably never become clogged at the same time, and I would recommend that the proposed overflow be omitted.

With respect to the capacity of this siphon, it is found that it is considerably less than the capacity of the 12-inch sewer tributary to it and that it will probably not carry the probable ultimate future contribution of sewage of the territory to be served by it. Inasmuch as the contribution of sewage will in all probability be small when the sewer system is first installed, I believe that the 6-inch line of the siphon will be adequate as to size and capacity to care for the sewage tributary to it for a number of years to come. In order, however, to care for the ultimate maximum rate of flow, the 8-inch line should, in my opinion, be replaced by a 10-inch line. Two 8-inch lines would also answer the purpose.

The entire sanitary sewage of the two communities is to be discharged into the suction or pump well of a proposed pumping station, from which it is to be delivered, through an 8-inch force main, to the preliminary settling tank of the disposal plant. The sewage upon reaching the pumping station will be passed through a small covered screen chamber, 3'x3' in plan, located in one corner of the pump well and provided with a bar screen composed of ⅜"x2" bars 4' 2" long. These bars are spaced ½-inch apart in the clear. This spacing would probably tend to produce a rapid clogging of the screen and consequently increase the cost of maintenance. I do not believe that it would be advisable to place the bars closer than 1 inch in the clear.

The pump well, which is to be covered, is 15'x30' in plan and has a capacity of 12,000 gallons when filled to a proposed emergency overflow located 2 feet 8 inches above the bottom of the upper end of the well. According to the report of the designing engineers, the emergency overflow is to be installed simply to provide an outlet for the sewage in case both of the pumps in the pumping station are disabled for more than 35 minutes at a time. No overflow whereby the disposal plant can be by-passed should be permitted. Both pumps would probably not be disabled at the same time and it would be possible to provide for a breakdown of the electric power either by installing an auxiliary gas engine and electric generator or by providing an additional pump and engine.

The proposed pumping station is to be equipped with two 4-inch centrifugal pumps located in a dry well with independent suctions extending through the wall of the pumping station to the suction well. Each pump is to have a capacity of 500,000 gallons per day and is to be driven by an automatically operated 7 h. p. electric motor. The pumps will operate against a static head of about 20 feet.

It is proposed to treat the sewage of the two villages in a sewage disposal plant located on Oneida creek about 1,000 feet below the developed portions of Kenwood and about 3 miles above the city of Oneida. This stream, which is tributary to Oneida lake, has a drainage area at this point of about 64 square miles. The low summer flow of the stream at this point is probably between 10 and 20 cubic feet per second. Flows as low as 3 cubic feet per second have been recorded occasionally. Oneida creek is not used as a source of public water supply below Kenwood and the disposal plant appears to be favorably located both with reference to the developed portions of the adjacent communities and to the elevation of the creek.

The sewage disposal plant, which is to consist of a settling tank, dosing chamber, sprinkling filter, final settling tank and auxiliary sludge bed for the disposal of sludge, has been designed to care for an ultimate population of 5,000 persons. According to the report of the designing engineers, the sewage to be treated will contain little or no manufacturing wastes, except from a small fruit canning factory for a short period of each year.

The proposed settling tank is to be a horizontal flow tank of the Imhoff type 49′x29′x18′3⅛″ deep inside dimensions with a depth below the flow line of 16¼ feet. It is to be divided by means of partition walls into 4 upper or settling compartments and two lower hopper-shaped sludge compartments for the storage and digestion of sludge.

The sewage from the pumping station is to discharge into channels which extend across each end of the tank and may be used either as influent or effluent channels inasmuch as the inlets and outlets are so arranged as to permit reversing the flow through the tank. The sewage enters and leaves the settling compartments over adjustable weirs.

The total capacity of the settling compartments of the tank is about 37,000 gallons and not 75,000 gallons, as stated in the engineers' report, and will give a detention period of about 1¾ hours for the ultimate population of 5,000, and about 7 hours' detention when serving the present population of 1,200, assuming a per capita rate of sewage contribution of 100 gallons per day for both ultimate and present conditions. It appears therefore that, whereas the capacity of the proposed tank is more than adequate to care for the present population and would allow for a considerable future growth, it would require two tanks of the size shown to provide for a detention period of 3.6 hours when serving the estimated ultimate population of 5,000, as planned for by the designing engineers.

A detention period of 7 hours, which would probably obtain for some time after the plant is first installed, is considerably longer than necessary or even desirable for tanks of this type, and I am of the opinion, furthermore, that greater flexibility of operation would result if the proposed tank were divided into two halves or two units of equal size for the first installation, and two tanks of two units each for ultimate conditions, and if each tank were so arranged as to permit of operating either or both units at one time.

The sludge chambers of the tank as planned are of sufficient size to provide storage for the sludge deposited from the sewage of about 5,000 people during a period of six months. It appears, therefore, that the sizes of the settling and sludge compartments are not well balanced. The sludge is to be removed from the sludge chambers through 8-inch cast-iron sludge pipes with bell-mouth ends extending to the apices of the chambers and discharged by gravity flow to sludge-drying beds located near the tank.

The bottoms of the hopper-shaped portions of the sludge chambers are to be constructed with slopes of one vertical to two horizontal. These slopes are the least on which bottoms of sludge chambers should be constructed, even where the width and length of the hoppers are much less than those proposed, and I am of the opinion that hoppers should be provided with steeper slopes, or that perforated water pipes should be placed around the end of the bell-mouth sludge pipes and around the top of the hopper, where the sloping bottoms meet the vertical sides, by means of which the sludge may be loosened by forcing water under pressure through the perforated pipes when emptying the sludge.

From the settling tank the clarified effluent is to flow into a dosing tank having a capacity of about 3,000 gallons. This tank is to be provided with a 12-inch automatic discharge siphon of the Miller type, by means of which the sewage will be discharged intermittently to the sprinkling filter at intervals of about 40 minutes when serving the present population and about 10 minutes for ultimate conditions.

The proposed sprinkling filter is to be divided into two units ser
from each other by a covered pipe gallery which extends thr

of the filter. Each unit is to be 51 feet 9 inches wide and 99 feet 8 inches long, inside dimensions, and is to be filled to a minimum depth of 5½ feet with broken stone ranging from 1½ inches to 2½ inches in size. The distributing system of the filter is to consist of a 12-inch cast-iron main located in the central pipe gallery, from which are to extend 4-inch cast-iron laterals spaced 11 feet 8 inches on centers with 3-inch risers and nozzles. The nozzles, which are staggered, are to have a spacing of 13 feet 6 inches. The underdrain system is to consist of a false floor composed of 6-inch split tiles laid with open joints which drain towards valleys in the filter floor containing 12-inch half tiles, which in turn discharge into a 15-inch main collecting drain laid at right angles to the pipe gallery.

The total area of the filter is about 0.24 acres. With both units in service the filter would operate at an average rate of 500,000 gallons per acre per day for present conditions. When serving the ultimate population the rate of operation will be about 2,000,000 gallons per acre per day.

The effluent from the sprinkling filter is to be passed through a final settling tank before it is discharged into the creek. This tank, which is of concrete, is 50'x10'x12'10" deep below the flow line. The tank is covered with an arched roof and has a bottom consisting of 5 pyramidal-shaped hoppers. The sludge accumulating in the tank is to be removed by means of 4-inch cast-iron pipes which extend to points near the apices of the hoppers and discharge by gravity flow to the sump well of the pumping station from which it will in turn be pumped with the sewage to the preliminary settling tank. The final settling tank has a capacity of nearly 42,000 gallons, equal to 8 and 2 hours flow of sewage, respectively, for present and ultimate conditions.

The proposed sludge bed is to be located between the preliminary settling tank and Oneida creek. It is to be 62 feet long by 25 feet wide and should be of sufficient size to properly care for the sludge deposited from the sewage of 5,000 persons. The filtering material is to consist of about 12 inches of graded gravel ranging from 2 inches to 1/16 of an inch in size, and a top layer of mortar sand ½-inch deep.

The sludge is to be applied to the surface of the filter by means of a concrete distributing trough extending along the center line of the bed. The underdrain system is to consist of lines of 3-inch vitrified tile pipe spaced 6 feet center to center and a central main drain 6 inches in diameter. The effluent from the sludge bed is to be discharged directly into Oneida creek.

In conclusion, I would state that it appears from our examination of the plans that they have, in general, been designed to satisfactorily meet the local requirements for sewerage and sewage disposal for the hamlets of Sherrill and Kenwood. There are, however, certain modifications which should be made in the plans before they are finally accepted, and I would therefore recommend that they be returned for modifications or additions in the following respects:

1. The spacing of manholes should be so reduced as to be not more than 500 feet in any case.
2. Manholes should be substituted for lampholes on long sections of sewers.
3. The overflows from the siphon manhole and pumping station should be omitted.
4. Either one 6-inch line and one 10-inch line or two 8-inch lines should be provided at the siphon crossing Oneida creek at Kingsley street extended in place of the proposed 6-inch and 8-inch lines.
5. The bars of the proposed bar screen should not be spaced closer than one inch in the clear.

With respect to the application of the Oneida Community, Ltd., with reference to the temporary omission from construction of the proposed sewage disposal plant, I would recommend that the consideration of this question be deferred until the plans have been revised and finally resubmitted for approval.

ALBANY, N. Y., *April* 17, 1914

Revised plans for sewerage and sewage disposal for the unincorporated villages of Kenwood and Sherrill in Madison and Oneida counties were resubmitted for approval on May 1, 1914, having been returned for modifications on April 20, 1914.

The plans now submitted show that they have been revised in complete accordance with all of the above requirements and that the maximum spacing of manholes is less than 500 feet; that manholes have been substituted for lampholes on long sections of the sewers; that the overflows from the siphon manhole and pumping station have been omitted; that two 8-inch lines have been substituted for the one 6-inch line and one 8-inch in the inverted siphon crossing Oneida creek; and that the spacing of the bars composing the bar screens has been increased to 1 inch in the clear. The report of the designing engineers and the specifications covering the plans have not been changed to conform with the plans, however.

The removal of the overflow at the pumping station made in accordance with our recommendations leaves the pumping station with no means for caring for the flow of sewage in the case of failure of the supply of electric current. In order, therefore, to provide for the continuous operation of the plant it will be necessary to provide for additional, independent motive power by installing either an auxiliary engine and electric generator to furnish electric current in case of emergency or to provide an additional engine and pump having a capacity equal to the probable maximum flow of sewage.

It is also found that no changes have been made in the revised plans in the design of the Imhoff tank. As noted in my report on the examination of the plans as first submitted, this tank, although of adequate capacity to care for the present population and allow for a considerable growth of the communities in the future, is only about one-half as large as necessary to properly care for the estimated ultimate population of 5,000 persons, which is the basis used in the design of the sewer system and the remaining portions of the sewage disposal plant. It is evident, therefore, that the disposal plant as a whole is not well balanced in this respect inasmuch as the pumping station, sprinkling filters, final settling tank and sludge bed, should if properly constructed and operated care for a population of 5,000, and the Imhoff tank will not care for more than from 2,500 to 3,000 persons. It will be necessary, therefore, to enlarge this portion of the disposal plant before the remainder of the plant is taxed to its full capacity and to construct an additional tank of the size shown by the plans whenever the population served by it shall exceed, say, 3,000 persons. Plans for such additional tank must be submitted to and approved by this Department before its construction.

As noted in my former report, application is made by the Oneida Community, Ltd., for permission to temporarily omit the construction of the proposed sewage disposal plant. The question of the treatment of the sewage from this community is closely associated with the disposal of the sewage of the city of Oneida, also located on Oneida creek about three miles below the community, and, inasmuch as you allowed the omission of the construction of the sprinkling filters, comprising the supplementary treatment works of the Oneida disposal plant, until November, 1915, I believe that it would be reasonable to allow the temporary omission of the disposal plant for Oneida Community, but to require that the entire plant be constructed and put in operation by November 1, 1915.

In view of the above, I would recommend that the plans be approved and a permit be issued allowing the discharge into Oneida creek of effluent from the proposed sewage disposal plant, and that the permit contain, in addition to the usual revocation and modification clauses, the following conditions:

1. That auxiliary pumping or power equipment be installed at the pumping station.
2. That an additional settling tank of the size shown by th installed when the population served by it shall exceed 3,0
3. That permission be granted to temporarily allow th construction of the proposed sewage disposal plant u 1915.

ALBANY, N. Y., *May* 12, 1914

PERMIT

A permit, containing the following conditions, was issued in connection with the approval of the plans on May 21, 1914:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary.
2. That the issuance of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.
3. That both the sewer system and the sewage disposal works shown by plans approved this day shall be fully constructed in complete conformity with such plans or approved amendments thereof except as provided in condition 4.
4. That the construction of the sewage disposal plant forming a part of the works for which plans are approved this day may be temporarily deferred, but that these sewage disposal works shall be constructed and put in operation by November 1, 1915.
5. That this permit shall be revocable on or after November 1, 1915, unless the complete sewage disposal works shall be constructed and put in operation on or before such time.
6. That only sanitary or domestic sewage and no storm water or surface water from streets, roofs or other areas shall be admitted to the proposed sewers or to the sewage disposal works.
7. That no sewage sludge from any part of the disposal works shall be discharged into Oneida creek or any other watercourse.
8. That auxiliary pumping or power equipment, in addition to and independent of that indicated on the plans, shall be installed at the pumping station.
9. That an additional settling tank of the capacity of the tank shown by the plans shall be installed whenever the population served by the sewer system shall exceed 3,000.

ONEONTA

In response to an application from the city of Oneonta, the time for constructing the intercepting sewers and sewage disposal works of the city, and putting the same in operation, was extended from September 1, 1914, to January 1, 1916. This extension was granted on November 24, 1914, and on December 7, 1914, plans for proposed sewers in Chester street were approved and a conditional permit issued. The report on the examination of the plans and the conditions of the permit issued follow.

Plans for a proposed sewer in the city of Oneonta, Otsego county, were submitted to this Department for approval by the Board of Public Works on November 28, 1914.

The records of the Department show that on December 2, 1912, plans were approved for sewer extensions and for the interception and treatment of the entire sanitary sewage of the city. On the same date a notice was issued by the common council of Oneonta requiring the city to construct all portions of the sanitary intercepting and outfall sewers and the pumping station and settling tanks forming a portion of the sewage disposal works shown by the plans approved on December 2, 1912, and have them completed and put in operation by September 1, 1914.

The plans now before the Department and under consideration were first submitted for approval on October 7, 1914. It appeared, however, that the portions of the sewage disposal works specified in the above notice had not been constructed. The plans were therefore returned to the village and the village authorities were advised that action could not be taken on the plans until definite steps are taken by the city to comply with the above requirement.

It was learned from a conference held in this office with the mayor and superintendent of public works of Oneonta on October 22 that two of the three sections of the intercepting sewer had been constructed but that, owing to the present condition of the money market, the city was unable to sell bonds to cover the necessary construction. Under date of October 26, 1914, a letter was received from the mayor further explaining the financial conditions of the city and asking for an extension of the time set for completing the remaining portion of the intercepting sewer, pump station and settling tank, and on November 24, after a careful consideration of the application, a permit was issued to the city extending the time for completing the construction of the remaining portion of the intercepting sewer and sewage disposal works from September 1, 1914, to January 1, 1916.

The plans for sewerage and sewage disposal, approved on December 2, 1912, and referred to above, showed an 8-inch sewer in Chester street between East End avenue and Rose avenue, a distance of some 900 feet. The western portion of this sewer was shown discharging directly into the proposed intercepting sewer in Rose avenue, and the eastern portion of the sewer was shown discharging into the proposed sewer in Reynolds avenue, which sewer connected with the Frederick street sewer, a tributary of the proposed intercepting sewer.

The plans now submitted show that it is proposed to increase the size of the proposed sewer in Chester street from 8 to 10 inches in diameter, and to have it extend directly from East End avenue to Rose avenue, with manholes at Reynolds and Forest avenues. According to the report of the village engineer submitted with the plans the proposed change is made in order to care for a new manufacturing establishment on Chester street and so as to provide sewerage facilities for a large developed area in this section.

The lower section of the proposed sewer is shown with a slope of 6.3 per cent. and the upper portion of the sewer is shown with a slope of 1 per cent. It appears, however, from the elevation of the inverts of the manholes of the sewer, that, although the slope of the lower section of the sewer will be about 6 per cent., the slope of the upper section, if constructed in accordance with the plans, will be only about .24 per cent. Although there would be greater assurance that self-cleansing velocities would be obtained if the slope of the upper portion of the proposed sewer were increased somewhat, say .3 per cent., it is probable that no difficulty from stoppage will result if the sewer is laid with a slope of .24 per cent., provided it is properly constructed and maintained.

In conclusion, I would state that it appears, from our examination of the plans, that the proposed sewer, if properly constructed, should satisfactorily care for the sanitary sewage of the section to be served by it, and I would therefore recommend that the plans be approved and a permit be issued allowing the discharge into the Susquehanna river of sewage from the proposed sewer on condition that, after January 1, 1916, sewage from the proposed sewer shall not be discharged without treatment into the Susquehanna river, but shall be conveyed to and treated in the sewage disposal works for the city of Oneonta, to be constructed in accordance with the notice to the common council of the city of Oneonta issued by this Department on December 2, 1912, as amended by the extended permit issued to the city of Oneonta on November 24, 1914.

ALBANY, N. Y., *December* 2, 1914

PERMIT

A permit, containing the following conditions, was issued in connection with the approval of the plans on December 7, 1914:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary.
2. That the issuance of this permit shall not be deemed to affect in any way action by this Department on any future application that may be

made for permission to discharge additional sewage or effluent into the waters of this State.

3. That after January 1, 1916, sewage from the proposed sewer shall not be discharged without treatment into the Susquehanna river, but shall be conveyed to and treated in the sewage disposal works for the city of Oneonta, to be constructed in accordance with the notice to the common council of the city of Oneonta, issued by this Department on December 2, 1912, as amended by the extended permit issued to the city of Oneonta on November 24, 1914.

ONONDAGA COUNTY TUBERCULOSIS HOSPITAL

Plans for water supply, plumbing and sewage disposal for the Onondaga County Tuberculosis Hospital, were approved on December 18, 1914, on the conditions recommended by the following report: The approved plans show that the water supply of the hospital is to be furnished by the city of Syracuse from its public supply and that the proposed sewage disposal plant to treat the sewage is to consist of settling tank, dosing chambers, gate chamber, contact beds and absorption beds. The report on the examination of the plans follows:

Plans for water supply, plumbing and sewage disposal for the Onondaga County Tuberculosis Hospital were submitted to this Department for approval.

Original architectural plans for the institution showing the administration building and infirmary, were approved on December 19, 1913. No plans for water supply and sewage disposal had been received up to that time. The attention of the architects who prepared the plans was, therefore, called to the requirement that plans for water supply, sewerage and sewage disposal for the sanatorium be submitted to this Department for approval before such works are constructed. It was also recommended that the infirmary be located nearer the administration building when the hospital should be constructed.

It appears from the plans and data now submitted that, although the recommendation with reference to location of infirmary has not been carried out, a dining room and kitchen are to be provided in the infirmary and that this building is to be connected with the administration building by a service and utility subway which is to carry water pipes, electric conduits and other pipes and which will also permit of the use of a track to carry supplies from one building to the other so that the objectionable features due to the isolation of the infirmary have largely been removed.

The water supply of the institution is to be the same as that of the city of Syracuse and is to be conveyed to the hospital building through an 8-inch cast-iron pipe connected with the city mains. It appears from the report of the designing engineer that the elevation of the institution is practically the same as the highest distributing reservoir of the city. It is, therefore, proposed to install a booster system, consisting of duplicate pumps and pneumatic tanks for increasing and maintaining a static pressure of about 70 pounds together with a steam fire pump for fire protection.

The plumbing of the infirmary and of the administration building has been designed on the separate plan, that is, the storm water from the roofs of the buildings is to be collected and cared for in a system of piping separate from the system for sanitary or domestic sewage. The storm water to be collected by the roof gutter and leaders is to be discharged through an 8-inch drain, on the surface of the institution grounds southeast of the administration building. The sanitary sewage is to be conveyed to and treated in a sewage disposal plant to be located about 450 feet northeast of the administration building.

From our careful examination of the plans it would appear that the proposed plumbing fixtures are of satisfactory quality and should be adequate for the needs of the institution. The question of trapping the fixtures at the institution, however, has been the subject of considerable correspondence and a number of conferences with representatives of the architects and other parties interested in this feature of the plumbing of the building.

It appears that although the plumbing code of the city of Syracuse requires back venting of traps on plumbing fixtures, the present plans provide for antisiphon traps without back vents. The institution, however, is located outside of the city of Syracuse and, therefore, does not come under the jurisdiction of the city plumbing code.

The matter of trapping and venting plumbing fixtures has been the subject of considerable discussion and investigation of recent years and although the general practice seems to favor back venting, the substitution of antisiphon traps without back vents for the ordinary back vented "S" traps is not at all unusual at this time.

I am of the opinion that properly designated antisiphon traps withhout back vents may be used with safety provided the fixtures are not located too far from the soil pipes. It appears that some of the fixtures at this institution are planned to be located at considerably greater distances than twelve feet and that although it would be inconvenient, on account of the advanced condition of construction, to change the piping, I believe that it would be best here to properly vent these long lines or to relocate the fixtures so that the branch lines are not more than twelve feet from the soil pipes or to provide a branch soil pipe and carry the same through the roof or loop it back to the main soil pipe above all fixtures in the building. The architects who have charge of the construction of the buildings have already been advised of the necessity for complying with the above recommendations and you have been advised that they are being carried out.

The plans for sewage disposal show that it is proposed to treat the sanitary sewage of the institution in a sewage disposal plant located in a wooded area northeast of the administration building. According to the report of the designing engineer the disposal plant is designed to care for an ultimate population of 250 persons and an estimated daily per capita rate of water consumption of 100 gallons.

The sanitary sewage of the institution is to be collected by means of 6-inch house connections which discharge into a main 8 inches in diameter.

The greater portion of the main sewer is to be laid under the floor of the utilities corridor which connects the different buildings. This sewer is to have a minimum slope of .75%. Manholes are to be provided at all points of change of slope, at sewer intersections and at two changes of alignment. There are three changes of alignment of the main sewer between the utilities corridor and the disposal plant and although this portion of the sewer is to be laid with rather steep slopes manholes should nevertheless be placed at all points of change of alignment in order to facilitate cleaning and inspection of the sewer.

The proposed sewage disposal plant is to consist of a settling tank, two dosing chambers, a control or gate chamber, six contact beds, two absorption pits and an auxiliary sludge bed for the disposal of sludge. The matter of providing some other form of treatment for the contact bed effluent than by discharging it into absorption pits was taken up with the designing engineer when the plans were first submitted. It was stated by the engineer that the site of the disposal plant consists of a knoll of clean, coarse sand and gravel and that although he had considered other methods of disposal, such as subsurface irrigation and the carrying of an outlet sewer to Onondaga Creek, he had, owing to local conditions, selected the proposed method of disposal. With reference to the disposal of the sewage by means of subsurface irrigation it was pointed out by the engineer that this method was not suitable owing to the limited area available and since the site of the plant is more or less covered with trees.

The settling tank of the disposal plant is to be a horizontal flow tank of the Imhoff type 12 feet in diameter, 13½ feet deep with [illegible] depth of liquid of 11½ feet. It is to be divided by [illegible] titions into an upper or settling compartment and [illegible] and digestion compartment, The settling compartment will give an average period of detention of about 2¼ hours on the basis of design used and the sludge compartment is of adequate capacity to provide a storage period of about six months for the sludge deposited from the sewage contributed by a population of 250 persons.

It is proposed to remove the sludge from the tank by gravity flow and discharge it to an adjacent sludge bed by means of a 6-inch cast-iron pipe extending from the top of the tank to a point over the apex of the sludge hopper. The sludge pipe is to be provided with a 6-inch valve and is open at the top to facilitate cleaning and inspection. The head on the outlet of the sludge pipe at the tank is 4.5 feet and the hydraulic gradient from the tank to the sludge bed will be about 10%. The sludge bed is to have an area of 150 square feet and the filtering material is to consist of sand and gravel. The underdrain from the sludge bed is to discharge into the effluent pipe from the contact beds which in turn discharges into one of the absorption pits.

From the settling tank the clarified effluent may be discharged into either or both of the two proposed dosing chambers.. The two chambers are to be connected with gates and each chamber is to be provided with a 10-inch discharge siphon having a draft of 60 inches. The liquid capacity of each chamber below the flow line is about 8,000 gallons.

From the dosing chambers the sewage will be discharged intermittently by the siphons to a control chamber centrally located with respect to the contact beds. This chamber is provided with partition walls and five 12-inch outlets controlled by hand-operated gates so arranged that the sewage may be applied alternately to different sets of contact beds.

These beds, which are to be constructed with concrete sides and floors, are to have a combined area of about .075 acres and will be required to operate at an average rate of about 330,000 gallons per acre per day on the basis of design used. The beds are to be filled to a depth of about 4½ feet with filtering material ranging from one-half an inch to two inches in size. The lower 12 inches of filtering material surrounding the underdrains is to consist of 2-inch gravel. Above this is to be placed a 3-foot layer of gravel varying from ½ inch to 1½ inches in size with a top layer of coarse gravel 6 inches deep. I believe that the beds would be less liable to clog if none of the filtering materials were less than an inch in size.

It is planned to fill the contact beds when dosed to within 6 inches of the top of the filtering material. The distributing systems, by means of which the sewage is to be applied to the beds, are to consist of 12-inch, 10-inch and 8-inch tile pipes with 6-inch branches. The underdrain systems are to consist of false floors of 3-inch horseshoe tile. Each of the beds is to be provided with a timed discharge siphon by means of which the period of contact may be regulated.

The effluent from the contact beds is to be discharged through a 12-inch vitrified tile pipe to the two proposed absorption pits. The piping leading to the absorption pits is so arranged that either or both pits may be used at one time and provisions are made for extending the piping to additional pits if necessary in the future.

Each pit is to be 35 feet by 15 feet at the bottom and about 5.75 feet deep below the inlet pipe and is to be partly in excavation and partly in fill. An embankment, the top of which is to be at an elevation of about two feet above the invert of the inlet, is to be placed around each absorption pit. It is planned to fill the pits with large stone of uniform size and to cover this stone filling with small gravel and sand. I am of the opinion, however, that the efficiency of the absorption pits to absorb the contact bed effluent would be increased if the covering of small gravel and sand be omitted and if the pits are excavated to a sufficient depth to have the entire bottom of each pit extend into the coarser and more porous subsoil and not partly in excavation and partly in fill as proposed by the plans. I believe also that a ditch should be constructed around the upper side of the pits in order to intercept the surface wash and by diverting such wash prevent it from washing out or flooding the pits.

Although the rate at which the proposed absorption pits will ultimately be required to operate is very high it is probable that owing to the porous nature of the soil and other favorable local conditions as set forth by the designing engineer, the pits will, if properly constructed and maintained, care for the effluent from the contact beds for a reasonable period in the future. Provisions are also made by the plans to install additional absorption pits in the future if necessary.

In conclusion I would state that it appears from our examination of the plans that with certain reservations as set forth above the proposed water supply, plumbing and sewerage and sewage disposal systems if properly installed and maintained should satisfactorily meet the needs of the institution.

I would, therefore, recommend that the plans be approved on the following conditions:

1. That no trap shall be placed more than 12 feet from any soil stack unless the branch soil pipe with which the fixture is connected is carried independently through the roof or unless the branch soil pipe is looped back to the main soil pipe above all fixtures in the building.
2. That manholes be installed at all points of change of slope and alignment of the main sewer leading to the disposal plant.
3. That the excavation for the absorption pits be carried down to the subsoil and that the large stone with which the pits are to be filled be not covered with sand and gravel.
4. That whenever required by the State Commissioner of Health, additional absorption pits be constructed or some other means of final disposal of the effluent from the contact beds be provided for.

ALBANY, N. Y., *December* 11, 1914

PEEKSKILL

On April 29, 1914, plans for a proposed sewer in Walnut street were approved and on January 30, 1914, plans for a proposed sewer in Orchard street in the village of Peekskill were approved. The permits issued in connection with the approval of these plans required the submission of detailed plans for the interception and disposal of the sewage of the village on or before January 1, 1915. The reports on the examination of the plans and the conditions of the permits issued in connection with the approval of them are given below.

Plans for a proposed sewer extension in the village of Peekskill, Westchester county, were submitted to this Department for approval by the board of trustees on April 11, 1914. Application for approval of these plans and the issuance of a permit was received on April 18.

The plans show that it is proposed to construct a 10-inch sewer in Walnut street extending to and in Depew Park to the existing sewer in Freemont street, a distance of 561 feet. Although the Freemont street sewer is not shown on the general sewer map of the village on file in this office, the sewer presumably discharges into the Elm street sewer, a tributary of the Center street sewer, which discharges into the Hudson river at the foot of Center street extended.

The slope of the proposed sewer is not shown on the plans but it appears from the elevations of the inverts of the sewer shown by the profiles that it is to be constructed with slopes sufficiently steep to maintain self-cleansing velocities in the sewer and prevent clogging under ordinary conditions. Manholes are to be provided at all points of change of slope and alignment. It would appear from our examination of the plans that the proposed sewer if properly constructed should be adequate as to size and capacity to satisfactorily care for the sanitary sewage of the section to be served by it.

The sewerage conditions of the village and the question of sewa
were discussed in my report dated August 28, 1913, on the e

plans for proposed sewers in Hudson avenue and in Pomeroy and Elm streets and will therefore not be reviewed at this time except to state that owing to the urgent need for sewage disposal for the village it was considered necessary to require that steps be taken by the village to provide for the disposal of its sewage at an early date. The permits issued in connection with the approval of these and subsequent plans for sewer extensions in the village accordingly contained the following provisions:

> 1. That on or before January 1, 1915 satisfactory detailed plans for intercepting and outfall sewers to convey the entire sanitary sewage of the village of Peekskill to a suitable site for sewage disposal works, together with detailed plans for sewage disposal works to treat by sedimentation or clarification the entire sanitary sewage of the village shall be submitted to this Department for approval; and upon approval of said plans any or all portions of the intercepting and outfall sewers and of the sewage disposal works shall thereafter be constructed whenever required by the State Commissioner of Health.
>
> 2. That whenever required by the State Commissioner of Health satisfactory detailed plans for additional works for more complete treatment of the sewage of the village shall be submitted for approval; and that upon approval of said plans any or all portions of such additional or supplementary works for more complete treatment of sewage shall be constructed and put in operation at such time or times thereafter as said Commissioner may designate.

In view of the above I would recommend that the plans for the proposed sewer extension in Walnut street be approved and a permit be issued allowing the discharge of sewage from the proposed sewer into the Hudson river and that the permit contain in addition to the usual revocation and modification clauses the same conditions with reference to sewage disposal as those quoted above.

ALBANY, N. Y., *April* 28, 1914

PERMIT

A permit containing the following conditions was issued in connection with the approval of the plans on April 29, 1914.

> 1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary.
>
> 2. That the issuance of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.
>
> 3. That only sanitary or domestic sewage, and no storm water or surface water from streets, roofs or other areas shall be admitted to the proposed sewers.
>
> 4. That on or before January 1, 1915, satisfactory detailed plans for intercepting and outfall sewers to convey the entire sanitary sewage of the village of Peekskill to a suitable site for sewage disposal works, together with detailed plans for sewage disposal works to treat by sedimentation or clarification the entire sanitary sewage of the village shall be submitted to this Department for approval; and upon approval of said plans any or all portions of the intercepting and outfall sewers and of the sewage disposal works shall thereafter be constructed whenever required by the State Commissioner of Health.
>
> 5. That whenever required by the State Commissioner of Health, satisfactory detailed plans for additional works for more complete treatment of the sewage of the village shall be submitted for approval; and upon approval of said plans any or all portions of such additional or supplementary works for more complete treatment of the sewage shall be constructed and put in operation at such time or times thereafter as said Commissioner may designate.

A single copy of plans for the proposed sewer extension in the village of Peekskill, Westchester county, was submitted to this Department for approval by the board of trustees on June 16, 1914. A duplicate set of the plans together with an application for their approval was received on June 29.

The plans show that it is proposed to construct 181 feet of 8-inch sewer in Orchard street between Decatur street and Nelson avenue. The proposed sewer is to be laid on slopes of from 8.4 per cent. to 14.84 per cent. and is to connect with the existing sewer in Orchard street which empties into the Hudson river through the Main street outlet sewer. Manholes are to be constructed at points of change of slope and alignment of this sewer and if properly constructed should satisfactorily care for the sanitary sewage of the section to be served by it.

Only a small portion of the sewage of the village is treated at present. The condition of pollution of the Hudson river, however, is such that it was considered necessary to require the village to take steps to provide for the further disposal of its sewage and the permits recently issued in connection with the approval of plans for sewer extensions have been granted on the following conditions:

> 1. That on or before January 1, 1915, satisfactory detailed plans for intercepting and outfall sewers to convey the entire sanitary sewage of the village of Peekskill to a suitable site for sewage disposal works, totogether with detailed plans for sewage disposal works to treat by sedimentation or clarification the entire sanitary sewage of the village shall be submitted to this Department for approval; and upon the approval of said plans, any or all portions of the intercepting and outfall sewers and of the sewage disposal works shall thereafter be constructed whenever required by the State Commissioner of Health.
>
> 2. That whenever required by the State Commissioner of Health, satisfactory detailed plans for additional disposal works for more complete treatment of the sewage of the village shall be submitted for approval; and that upon approval of said plans any or all portions of such additional supplementary works for the more complete treatment of sewage shall be constructed and put in operation at such time or times thereafter as said Commissioner may designate.

In view of the above, I recommend that the plans for the proposed sewer extension in Orchard street be approved and a permit be issued allowing the discharge of sewage from the proposed sewer into the Hudson river and that the permit contain, in addition to the usual revocation and modification clauses the above conditions with reference to sewage disposal.

ALBANY, N. Y., *June* 29, 1914

PERMIT

A permit containing the following conditions was issued in connection with the approval of the plans on June 30, 1914.

> 1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary.
>
> 2. That the issuance of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.
>
> 3. That only sanitary or domestic sewage, and no storm water or surface water from streets, roofs or other areas shall be admitted to the proposed sewers.
>
> 4. That on or before January 1, 1915 satisfactory detailed plans for intercepting and outfall sewers to convey the entire sanitary sewage of the village of Peekskill to a suitable site for sewage disposal works, together with detailed plans for sewage disposal works to treat by sedimentation or clarification the entire sanitary sewage of the village shall

be submitted to this Department for approval; and upon approval of said plans any or all portions of the intercepting and outfalls sewers and of the sewage disposal works shall thereafter be constructed whenever required by the State Commissioner of Health.

5. That whenever required by the State Commissioner of Health satisfactory detailed plans for additional works for more complete treatment of the sewage of the village shall be submitted for approval; and upon approval of said plans any or all portions of such additional or supplementary works for more complete treatment of the sewage shall be constructed and put in operation at such time or times thereafter as said Commissioner may designate.

PERRYSBURG (J. N. Adam Hospital)

Plans for additional sewage disposal works for the J. N. Adam Hospital near Perrysburg, Cattaraugus county, were submitted for approval on August 14 and were approved on August 31. The report on the examination of the plans and the conditions of the permit issued in connection with the approval of them, follow.

Plans for additional sewage disposal works for the J. N. Adam Hospital near Perrysburg, Cattaraugus county, were submitted to this Department for approval on August 14, 1914.

The records of the Department show that original plans for sewage disposal works for the J. N. Adam Hospital were approved October 5, 1911, and a permit was issued allowing the discharge of effluent from the sewage disposal plant into Mill brook, a tributary of Cattaraugus creek.

The present plans were prepared by Frederick K. Wing of Buffalo, who states in his report that it is contemplated to increase the capacity of the hospital from 200 to about 375 or 400 persons. This increase in the number of persons contributing sewage to the sewage disposal plant necessitates an increase in the capacity of the disposal plant.

The proposed disposal plant which is apparently to be located about 1,000 feet northeast of the main building is designed for a population of 500 and a per capita water consumption of 150 gallons per day and is to consist of settling tanks of the Imhoff type, a dosing chamber, sprinkling filter and final sedimentation basin. Upon completion of the proposed disposal plant, the entire sewage of the hospital is to be passed through it and the disposal plant at present in use is to be retained as a reserve plant.

A manhole placed in the outfall sewer above the present disposal plant is to divert the sewage to the proposed disposal plant. Upon reaching the disposal plant, the sewage passes through a valve chamber by means of which the sewage may be allowed to enter the Imhoff tank from either end. The sewage then passes through the settling compartments of the Imhoff tank which have a capacity sufficient to give a period of detention of about 3½ hours. The solids settle through a slot into the sludge chamber which has a capacity of about 620 cubic feet providing a period of detention of the sludge of about 8 months. A sludge bed, consisting of sand 2 feet deep and having a superficial area of 475 square feet equal to about 0.95 square feet per person contributing sewage, is provided on which to dry the sludge.

From the Imhoff tank the sewage passes into a dosing chamber having a capacity of about 1,125 gallons. A Miller siphon will discharge the sewage onto a sprinkling filter bed at about 20-minute intervals. The sprinkling filter, which is to be filled with crushed stone to an average depth of 5.75 feet, is to have an area of approximately 0.04 of an acre. On the basis of 100 gallons of sewage contribution per capita per day the sprinkling filter will be required to operate at a rate of about 1,250,000 gallons per acre per day. The effluent of the sprinkling filter will pass through a final sedimentation basin. This basin is designed to have a capacity of approximately 8,438 gallons, giving a period of detention of the sewage in the tank of slightly more than 2.5 hours. The effluent of the final sedimentation basin is to be discharged into a brook which flows through the hospital farm.

The plans have been carefully examined with reference to the general method and efficiency of the disposal plant as a whole and practical operation of the individual structures, appurtenances and apparatus and after consideration of the local and general requirements with respect to proper methods for the disposal of the sewage from the hospital it appears that if properly constructed in conformity with the plans and efficiently operated, the proposed disposal plant should satisfactorily care for the sewage from the J. N. Adam Hospital. I would, therefore, recommend that these plans be approved and that a permit be issued allowing the discharge of effluent from the proposed disposal plant into Mill brook in the town of Perrysburg, Cattaraugus county.

ALBANY, N. Y., *August* 27, 1914

PERMIT

A permit containing the following conditions was issued in connection with the approval of the plans on August 31, 1914:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary.
2. That the issuance of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.
3. That the sewage disposal works shown by the plans approved this day shall be fully constructed in complete conformity with such plans or approved amendments thereof.
4. That only sanitary or domestic sewage and no storm water or surface water from streets, roofs or other areas shall be admitted to the proposed disposal works.
5. That no sewage sludge from any part of the disposal works shall be discharged into Mill brook or any other watercourse.
6. That whenever required by the State Commissioner of Health satisfactory plans showing works for disinfecting the effluent from the sprinkling filters or satisfactory detailed plans for additional works for more complete treatment of the sewage of the hospital shall be submitted for approval; and upon approval of such plans any or all portions of such additional or supplementary works for disinfection of effluent, or for more complete treatment of sewage shall be constructed and put in operation at such time or times thereafter as said Commissioner may designate.

PORT CHESTER

Amended plans for interception and disposal of the sewage of the village of Port Chester were approved on July 28, 1914, on the conditions recommended in the following report:

Amended plans for the interception and disposal of the sewage of the village of Port Chester, Westchester county, were submitted to this Department for approval by the designing engineer on behalf of the board of trustees on April 13, 1914. Application for the approval of the plans dated April 10 was also received on April 13 and on May 8 detailed plans for the interception and disposal of the sewage were received.

Original plans for intercepting and outfall sewers and for a pumping station and sewage disposal plant consisting of a settling tank of the Imhoff stated, however, that these slopes should not be less than .4 per cent. for 8-inch sewers or less than .3 per cent. for 10-inch sewers in this case, inasmuch as the flow of the sewage will not be large.

No manholes are shown on the proposed sewers, and some of the sewers are shown with curved alignments. It is important that manholes should be constructed at all points of change of slope and alignment and at sewer intersections, and that the sewers be laid with straight slopes and alignments between adjacent manholes.

The proposed sewage disposal plant, consisting of a septic tank, dosing chamber and subsurface irrigation system is to be located in a triangular area formed by Hyde Park road, Flat terrace and Baker avenue. The nearest point of the disposal plant is about 200 feet from the hospital.

The proposed septic tank forming the preliminary portion of the disposal plant has been designed in general accordance with the recommendations contained in our last report. It is to be divided by means of a 12-inch wall into two longitudinal compartments 17½ feet long, 8 feet wide and 10 feet deep below the flow line. The inlet to each compartment is so arranged as to permit of operating either or both compartments at one time. Baffle boards are to be installed near the inlet and outlet weirs of the tank.

Each compartment will have a capacity of 10,500 gallons, which will give a time of detention of about fifty hours when serving fifty persons and over seven hours when serving the estimated ultimate population of 350 persons. It is evident that these compartments are larger than necessary and could be reduced to advantage by making the depth 6 feet instead of 10 feet. This would give about thirty hours' detention of the sewage in one compartment when serving fifty persons and about eight and one-half hours' detention for both compartments when serving the estimated ultimate population of 350 persons. It should not be necessary to exceed these detention periods.

The plans show a pipe with a gate valve located about a foot above the bottom of the tank near the outlet end of each compartment and, according to the specifications submitted with the plans, it is to be used to draw off the liquid when cleaning the tank. The plans, however, do not show the point of discharge of this pipe. The sludge should be disposed of by burying or on properly constructed sludge beds, and on no condition should it be permitted to discharge into any stream or watercourse.

From the settling tank the clarified sewage is to flow over weirs into a dosing chamber having a capacity of 330 cubic feet. This chamber is provided with two discharge siphons of the Miller type, which are to discharge into a gate chamber having three 10-inch outlets leading to the different sections of the subsurface irrigation system. One dose of the dosing chamber appears to be adequate to fill two sections of the subsurface irrigation system.

The distributing system of this disposal field is to consist of three 10-inch main distributors, with eighteen lines of laterals of 4-inch agricultural tile spaced not less than seven feet apart. These laterals are to be laid in trenches and surrounded with four square feet of crushed stone. Each line is to be 300 feet long, giving 5,400 feet of the distributing tile for the entire system, which will cover an area of about 1.7 acres.

Assuming that the soil will absorb the sewage at the rate of 12,000 gallons per acre per day, which rate could probably not be exceeded in soil of the nature found at the disposal plant, the system will care for a population of not over 200 persons. With this population there would be twenty-seven feet of distributing tile per person served. It is possible, however, that even this rate could not be maintained successfully and that it will become necessary in the future to extend the system or to adopt some other means of supplementary treatment, such as sand filtration, before this population is reached.

In conclusion, I would state that it appears from our careful examination of the plans that, although the proposed septic tank is adequate as to capacity to care for the estimated ultimate population of 350 persons, even though the depth of the tank be decreased to six feet, the supplementary treatment works or subsurface irrigation system would probably not care for more than 200 people at the most. It is possible, however, that before this population is reached the sewer system of the city will be extended to care for the section

The plans for the outlet sewer show that it is proposed to provide for a multiple outlet consisting of a double row of 6-inch holes spaced 10 feet apart in the lower section of the outfall sewer as suggested by us. It appears also from the plans that the method of caring for the sludge from the settling tank is to be the same as provided for by the plans approved last year, namely, by discharging it into scows and dumping it at sea.

In conclusion I would state that the present plans constitute amendments to the plans for the interception and disposal of sewage of the village approved by this Department on April 28, 1911, and October 14, 1913, and show more in detail the method of construction of the sewers and disposal plant, but do not provide for any change in the general scheme for the interception and the disposal of the sewage. The point of discharge of the effluent from the plant is also to be the same as shown on the plans heretofore approved.

I would, therefore, recommend that the plans be approved on the following conditions:

1. That no sludge be deposited in water less than 20 feet deep nor at a point within 10 miles from any shore.

2. That the existing sewer in Westchester avenue be broken below the intercepting sewer.

ALBANY, N. Y., *July 21, 1914*

PORT HENRY

Plans for proposed sewer extension in the village of Port Henry were approved on August [illegible], 1914. The report on the examination of the plans and the conditions of the permit issued in connection with the approval of them are printed below.

Plans for the proposed sewer extension in the village of Port Henry, Essex county, were submitted to this Department for approval by the Board of Trustees on April [illegible], 1914.

According to the first annual report of the State Water Supply Commission for the year ending [illegible] the village is provided with a [illegible] sewer system serving [illegible] and discharging without treatment into [illegible] [illegible]

[illegible]

[illegible]

[illegible]

the case of all permits issued for the discharge of sewage that provisions should be made for the future treatment of such sewage before its discharge into any stream or other body of water especially where public water supplies are involved. I am of the opinion that it is important that the village of Port Henry should at an early date provide for the treatment of its sewage not only for the protection of the village itself but also for the protection of other municipalities along the lake some of which derive their water supplies from the lake. The village should employ the services of a competent sanitary engineer to make a study of its sewerage problem with reference to the most appropriate method of collecting and disposing of the sewage and to prepare plans for a comprehensive sewer system showing all existing sewers as well as proposed sewers, such plans to be submitted to this Department for approval.

If the existing sewer system has been constructed on the combined plan as the report of the State Water Supply Commission would indicate the plans should provide for a complete separation of the storm water from the sanitary sewage in view of the needs for future treatment of the sewage of the village since it is impracticable from the standpoint of economy to install a sewage disposal plant of adequate capacity to properly treat combined sewage.

In view of the above, I would recommend that the plans be approved and a permit be issued allowing the discharge into Lake Champlain of sewage from the proposed sewer in Mill street. I would further recommend that the permit contain in addition to the usual revocation and modification clauses the following conditions.

1. That manholes be placed at the upper and lower ends of the proposed sewer as well as at the point of change of slope of the sewer unless the sewers can be laid with a straight slope between the upper and lower manholes.

2. That on or before October 1, 1915, satisfactory detailed plans for the collection and preliminary treatment of the sewage by clarification or sedimentation together with general plans for supplementary or more complete treatment of the sewage should such supplementary or complete treatment of the sewage be required, be submitted to this Department for approval.

ALBANY, N. Y., *August* 27, 1914

PERMIT

A permit containing the following conditions, was issued in connection with the approval of the plans on August 31, 1914:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary.

2. That the issuance of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.

3. That only sanitary or domestic sewage, and no storm water or surface water from streets, roofs or other areas shall be admitted to the proposed sewers.

4. That manholes shall be constructed at the upper and lower ends of the proposed sewer and also at the point where the slope of the sewer changes unless the sewer can be laid with a straight slope between the manholes at the upper and lower ends of the sewer.

5. That on or before October 1, 1915, the village authorities shall submit to this Department for approval satisfactory detailed plans for a comprehensive sanitary sewer system for the village and for the sedimentation of the entire sanitary sewage of the village together with general plans for more complete treatment of the sewage.

6. That whenever required by the State Commissioner of Health the works for said sedimentation or for more complete treatment of the sewage shall be constructed and put in operation in accordance with *detailed plans* approved by this Department.

POUGHKEEPSIE (St. Francis Hospital)

Plans for sewage disposal consisting of settling tanks, dosing tank and subsurface irrigation system to care for the sewage of the St. Francis Hospital in the town of Poughkeepsie, Dutchess county, were submitted for approval on February 2, 1914, and, after a careful examination of them, they were returned for modification. Plans revised in accordance with the requirements of the Department were resubmitted on February 26 and were approved on March 18, 1914. The reports on the examination of the plans follow:

Plans for sewage disposal for the St. Francis Hospital at Poughkeepsie, Dutchess county, were submitted to this Department for approval on February 2, 1914.

According to the data submitted with the plans, it appears that the proposed hospital to be constructed at Poughkeepsie will care for about 50 persons at first and that it is expected that this number will gradually increase to about 350 in 10 years. It is proposed to treat the sewage from the institution in a sewage disposal plant consisting of a septic tank, dosing chamber and subsurface irrigation system.

The plans are not complete, as they do not show the location of the proposed sewage disposal plant with reference to the institution buildings, streets, highways and other buildings. A sketch plan drawn approximately to scale and showing distances of the different portions of the disposal plant from the buildings and the location, size and slope of the proposed sewer connecting the buildings with the disposal plant, should be submitted. The location of the property should also be described, giving distances from nearest streets and watercourses, or a sketch plan of the portion of the town in which the institution is to be situated should be submitted.

The proposed septic tank comprising the preliminary treatment works is to be covered and is shown divided into two compartments designed to operate in series. Each compartment is 14 feet long by 10 feet wide and 10 feet deep, equal to a capacity of about 10,000 gallons, and will give a time of detention of sewage of about 50 hours for the immediate future and between 7 and 8 hours' detention for ultimate conditions on the basis of a daily per capita rate of sewage contribution of 100 gallons. The inlets and outlets of the two compartments are submerged. It is proposed to collect the clarified sewage by means of 12-inch cast-iron pipes with sides perforated with ½ and ¼-inch holes. These pipes as planned are to be located about 5 feet above the bottom of each compartment and are to connect with 90-degree bends with riser pipes ending in goose necks extending through the walls of the adjacent compartments.

Although the proposed arrangement would tend to prevent the grosser solids in suspension from passing out of the tank, the holes of the collecting pipes would in all probability become clogged both from rust and fungus growths, which develop in sewage. A better arrangement would be to provide for submerged inlets consisting of pipes with quarter bends with submerged ends extending about one foot below the flow line or to have the outlet discharge openly either through pipes or over weirs with baffle boards placed across the tank near the outlet and to prevent scum and other floating material from passing out of the tank.

The septic tank as a whole, moreover, does not appear to be arranged to good advantage, as practically no additional sedimentation will be obtained by passing the sewage through the second compartment. It would seem that a more satisfactory arrangement would be to divide the tank into two longitudinal compartments by means of a partition wall and to arrange the inlets and outlets so that either or both compartments may be operated at one time. This would give greater flexibility of operation than with the proposed arrangement and would also permit one tank to be thrown out of use for cleaning without disturbing the flow of the other tank. Two parallel tanks, 8′ x 18′ and, say, 5 or 6 feet deep, would give a total time of detention for both compartments of not less than 8 hours for the ultimate conditions and would render the operation much more effective than under the present arrangement. Arrangements should also be made for the drawing off of the sludge and disposing of it on suitable sludge-drying beds at a proper location not too near the hospital.

From the septic tank it is proposed to discharge the sewage into a dosing tank having a capacity of about 360 cubic feet. This tank is to be provided with an 8-inch siphon of the Miller type by means of which the clarified sewage is to be discharged intermittently into the distributing system of the proposed subsurface irrigation field.

This system is to consist of a 12-inch main distributor and 12 lines of 4-inch agricultural tile drains 100 feet long. These tiles are to be laid in trenches 4 feet below the surface of the ground and are to be surrounded with crushed stone. At a conference at this Department on February 11 Mr. C. E. Bloom, representing the contractors, stated that the soil at the proposed irrigation field is a sandy clay or clay loam, and that it was proposed to lay the lateral branches of subsurface tiling in lines 5 feet apart in a trench having 4 square feet of its section composed of broken stone. Soil of this character may absorb sewage at the rate of 10,000 to 12,000 gallons per acre per day, and it is not considered safe to base the design of subsurface irrigation systems on higher rates than 10,000 to 12,000 gallons per acre per day under the conditions described above. The area which should be laid out as a subsurface irrigation field, therefore, to treat sewage from the population at the hospital immediately expected, namely, 50 persons, should not be less than 0.5 acres. Similarly, to care for the sewage from 350 persons, which is the population finally expected at the hospital, the area of the subsurface irrigation field ultimately to be utilized should not be less than 3 acres. It is suggested, however, that the spacing between lateral lines of subsurface tiling be increased from 5 feet to 7 feet, since it is believed that with the proposed manner of laying this tiling in a bed of broken stone 2 feet square, the distribution of the effluent over the irrigation area will be satisfactory with the greater spacing as above, and this arrangement will lessen the amount of trenching and tiling necessary.

The capacity of various soils to care for sewage, whether it is distributed over the surface or through subsurface tiling, varies greatly with different soils and depends on the character and porosity of the soil, the height of ground water with reference to the surface and the general condition of the land with respect to natural drainage. For this reason when any question exists as to the suitability and practicability of adopting the method of subsurface irrigation for disposing of sewage from as many as 350 persons, it is very essential that every precaution be taken to arrange for the most advantageous operation of the plant. In this connection it should be stated that provision should be made in the plans for division of the subsurface irrigation system into two or more, and preferably four or five, portions in order that opportunity may be had to throw one portion out of use at intervals of one or two weeks to give the soil an opportunity to dry out. This alternation of the use of various portions of the subsurface tiling requires the construction of a diverting manhole or the installation of some other device for successively throwing out of use or resting each section of the subsurface system. It is suggested also that, with such a comparatively large installation of this type of disposal plant, it may be found necessary to provide riser pipes at the ends of each lateral line, such riser pipes reaching above the ground to a sufficient height to prevent accidental overflowing, but acting as vents and aiding the operation of the system. The question of proper gradients should be carefully considered in the design of the subsurface system.

With reference to the discharge of effluent from the siphon chamber into the subsurface system it is suggested that with such a large system of lateral tiling as will ultimately be required, careful consideration should be given to the relative size of the dosing or siphon chamber and the capacity of the section or sections of the subsurface system into which effluent at each discharge of the siphon will flow. It might be advisable to consider the use of double alternating siphons to deliver the dose alternately to one out of three or to two out of five portions of the subsurface system.

In conclusion, I would state that it is found from our careful examination of the plans that they are not in satisfactory condition for approval, and before a decision can be reached as to a final acceptance of them, additional data should be submitted and they should be revised in accordance with the following recommendations:

1. The proposed settling tank should be divided into 2 parallel compartments having a total capacity equal to not less than 8 hours' flow of sewage for the ultimate conditions and so arranged that either or both compartments may be operated at one time.
2. The outlet from the settling tanks should be so arranged as to prevent clogging.
3. The complete subsurface irrigation system should be shown in full detail and should be designed in general accordance with the suggestions embodied in this report.
4. Data should be submitted as to the nature of the soil at the site of the subsurface irrigation field and the area available in order that it may be determined if the proposed method of supplementary treatment is suitable at the institution.
5. A general plan showing the institution property, location of the sewage disposal plant, with reference to the different buildings, and the sewer from the building to the disposal plant should be shown.
6. A description of the location of the institution, giving distances from the nearest streets and watercourses, should be presented, or a sketch plan of the portion of the city in which the hospital is to be located should be submitted.

I would therefore recommend that the plans be returned for revision and that the designer be asked to submit additional plans and data in accordance with the above requirements.

ALBANY, N. Y., *February* 13, 1914

Revised plans for sewage disposal for St. Francis Hospital, in the town of Poughkeepsie, Dutchess county, were resubmitted for approval on February 26, 1914.

From our careful examination of the plans now submitted, I find that they have in general been modified and additional data submitted in accordance with the above requirements. The general sketch plan of the property shows that the hospital property comprises an area of some thirty acres situated in what is known as Hillcrest, about 500 feet north of the northerly city line of Poughkeepsie and just east of North or Hyde Park road, an extension of Washington avenue, in the city of Poughkeepsie.

These plans, as well as the general plans for the interception and treatment of the sewage of the city of Poughkeepsie, approved on November 10, 1913, show that it is proposed ultimately to serve the area north of the city, including the hospital property, by a trunk sewer in North road and Delafield street, connecting with the proposed intercepting sewer and sewage disposal works of the city. This sewer would run only about 150 feet from the hospital property, and in all probability connections could be made by the hospital with this sewer when constructed.

The topographical map of the institution recently submitted shows that there are, in addition to the hospital property, ten cottages to be served by the proposed sewage disposal plant. The sewage from the hospital and these houses is to be conveyed to the disposal plant by means of 8 and 10-inch sewers. Except for the profile of the lower portion of the 10-inch sewer leading to the disposal plant, no slopes or other details of the sewers are shown. It appears, however, from the topographical map submitted, that it will be possible to construct these sewers with sufficiently steep slopes to produce self-cleansing velocities in them under ordinary conditions. It may be north of the city line, including the hospital property, which is so located that it can be drained into the sewer constructed in Delafield street and North road.

In view of the above, I would recommend that the plans be approved on condition that no sewage or sewage sludge be discharged into any stream or watercourse, and that whenever required by the State Commissioner of Health the subsurface irrigation system shall be extended, or some other suitable method of sewage disposal adopted, in accordance with the plans approved by him.

ALBANY, N. Y., *March* 14, 1914

ROCHESTER

On January 19, 1914, amended detail plans for intercepting and outfall sewers and for sewage disposal works consisting of six screen and detritus tanks and 12 Imhoff tanks to treat the sanitary sewage of the city were approved. The report on the examination of the plans and the conditions of the permit issued, follow.

Amended and detail plans for intercepting and outfall sewers and sewage disposal works for the city of Rochester were submitted for approval by the city on January 15, 1914. These plans were submitted in accordance with the provisions of the Public Health Law and certain conditions stipulated in the permit issued to the city of Rochester in connection with the approval of the general plans for intercepting sewers and sewage disposal works submitted by the city of Rochester in 1910, and approved by you on September 22 of that year.

The general features of the problem of the interception and disposal of the sewage at Rochester were fully discussed in various reports submitted to you in 1910, and published in the Thirty-first Annual Report of this Department for that year. In general the plans provided for a system of intercepting and outfall sewers for the collection of the sewage of the city and its conveyance to a proposed sewage disposal works situated about one-half mile south of Lake Ontario and about three miles north of the northerly city line; and an outlet sewer extending from the sewage disposal works to a point well out into Lake Ontario.

The intercepting and outfall sewer was to extend from the intersection of North Water street and Central avenue to the sewage disposal works, a distance of some 7½ miles. Except for the inverted siphon section crossing the Genesee river near the Rome, Watertown and Ogdensburg Railroad the proposed sewer was to vary in size from 3′ 6″ to 6′ 0″ in diameter and was to have a maximum capacity when flowing full of about 100,000,000 gallons, equal to 3½ times the estimated dry weather flow of sewage on the basis of design used. The outlet sewer was to be a 5′ steel pipe extending into the lake to a point about 7,000 feet from the shore.

The proposed sewage disposal provided for a treatment of the sewage in six detritus tanks each furnished with two screens, one a flat iron bar screen placed at the inlet end of each tank and the other a revolving screen placed in the outlet channel from each tank. The wire cloth forming the fine screen was to have openings approximately one-tenth inch in size. From these detritus tanks the sewage was to be conveyed to and be passed through six supplementary settling tanks having a total capacity of twice the capacity of the detritus tanks.

The plans now submitted for approval conform in general to the plans heretofore approved in respect to alignment and grades of intercepting and outfall sewers and the method of purification by sedimentation. They provide, however, for increased size and capacity for intercepting and outfall sewers to meet an increased ultimate population. They also provide for an improved change in the works for purification by the substitution of six detritus tanks of new design and twenty settling tanks of the Emscher or Imhoff type in place of the plain settling tanks shown by the original plans.

Furthermore, these plans show provision for eighty sludge drying beds for the disposal of sludge not shown on the original plans.

The changes involved in reference to the intercepting and outfall sewer to the disposal works and the outlet sewer into the lake embody an increase in size and capacity and was deemed advisable as the result of an actually higher population, as shown by the 1910 census, than was estimated. The new intercepting and outfall sewer varies in size from 5′ 6″ to 8′ 0″ diameter, whereas as stated above the original range of size was from 3′ 6″ to 6′ 0″. The new outlet sewer is 5′ 6″, whereas the original size was 5′ 0″. These increases in size provide for a capacity when flowing full of three and a half times the dry weather flow. The sizes of the new sewers are based on an ultimate future tributary population of about 450,000 and a daily dry weather flow of 120 gallons per capita and a storm weather flow of three and a half times the dry weather flow.

The proposed sewage disposal plant is designed upon the same basis of population and flow as were used in the design of the intercepting and outfall sewers. It is planned, however, to construct all of the detritus tanks but only one-half of the settling tanks and only one-half of the sludge beds at the present time and it is assumed that this installation will take care of a population of 260,000 persons which is the estimated population for 1916. The per capita rate of sewage contribution assumed is 100 gallons and 350 gallons per day for dry weather and storm weather conditions respectively.

The sewage upon reaching the disposal plant is to be passed through coarse racks at the entrance to the detritus tanks. Each detritus tank is to be 90′ long and 10′ wide with a depth below the flow line when the tanks are clean of from 4.4′ to 7.4′ respectively for dry weather and storm flows. The tanks which are to be operated in parallel are so arranged that all or any number of the tanks may be operated at one time. According to the report of the Consulting Engineer it is tentatively proposed at first to operate two tanks for dry weather and four tanks for storm weather conditions. It is planned to so operate the tanks either by allowing them to partially fill up with detritus or by limiting the number of tanks in use as to obtain velocities in them of from .64 to .95 feet per second. For ultimate conditions of storm flow the six detritus tanks when clean will give about 2½ minutes detention and a velocity of flow through the tanks of about 7/10 of a foot per second. This modification will tend to cause an interception of only the coarser inorganic suspended matters in the detritus tanks and transfer the finer organic suspended matters to the Imhoff tanks. This will result in a more satisfactory disposition of the inorganic and the organic matters in the two types of tanks.

In the contracted section at the lower end of each detritus tank is to be placed a mechanically cleaned screen with one-half inch openings through which the sewage is to be passed before entering the settling tanks. The sewage after leaving the screens is to flow through two main influent channels which are to feed the Imhoff tanks situated on each side of the channels. There are ultimately to be twenty tanks constructed in ten groups of two tanks each.

The proposed Imhoff tanks are to be of longitudinal-horizontal flow type. Each tank is to be 110 feet long by 35 feet wide inside dimensions with a depth from the flow line to the bottom of the sludge hoppers of about 35 feet. Each tank is to be divided by means of concrete partitions into two upper or settling compartments and three lower hopper shaped sludge compartments. The total settling capacity of the twenty tanks will give a time of detention on the basis of design used for ultimate conditions of nearly one and a half hours for dry weather flow and about twenty-five minutes detention for storm weather conditions.

As noted above it is planned to construct only ten settling tanks at first. These tanks will give practically the same detention periods when serving 260,000 persons, the estimated population for the year 1916 as for ultimate conditions for dry and wet weather flows as stated above. I am of the opinion, however, that provisions should be made in the first installation for a greater population than 260,000 and that not less than twelve settling tanks should be constructed at first so as to obviate the necessity of enlarging the plant a year or two after its completion.

The sludge compartments of the tanks provide for about two cubic feet per capita which should be adequate to give storage period of from four to six months. The sludge is to be removed from the sludge compartments of the tanks by means of eight inch sludge pipes which are to discharge by gravity flow into sludge channels leading to the sludge drying beds.

These beds are about 44 feet square in area and it is planned to have eight beds serve each group of two settling tanks. The filtering material of the beds is to consist of a bottom layer of coarse angular material six inches deep, above which are to be placed an eight inch layer of gravel and coarse sand, and a three inch layer of coarse sand with a top layer of fine sand two inches deep. The beds are to be underdrained by means of parallel lines of three inch drain tiles spaced about seven feet apart. The area of the sludge beds as planned will give about one-third of a square foot of drying surface per person served.

In view of the foregoing and as a result of our careful examination of these plans I am of the opinion that they are not only in conformity with the general requirements for sewage disposal of Rochester, adopted by you in your approval in 1910, but that the amendments involved in the new plans are, in view of the more adequate provision for future population of the city and adjacent territory comprising the sewer district, the more adequate capacity for intercepting and outfall sewers and more modern and improved method and type of tank treatment, an improvement over the original plans approved in 1910.

I therefore recommend that the plans as submitted be approved and that a permit be issued to the city of Rochester to discharge sewage effluent from these sewage disposal works through the outfall sewer in the manner as shown on the plans upon the conditions stipulated in the permit issued by you September 22, 1910, and upon the further condition that at least twelve tanks instead of the ten tanks as proposed, be constructed with the first installation.

ALBANY, N. Y., *January* 17, 1914

PERMIT

A permit, containing the following conditions, was issued in connection with the approval of the plans on January 19, 1914:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary.
2. That all portions of the sewage disposal works shall be fully constructed in complete conformity with the plans as approved or with such detailed plans as may hereafter be called for and approved by this Department; and the general methods of operating such works shall at all times conform to the requirements of the State Commissioner of Health.
3. That multiple outlets shall be constructed and the outfall sewer shall be extended when in the judgment of the State Commissioner of Health such construction and extension shall become necessary or desirable.
4. That no sewage sludge from any part of the disposal works shall be discharged into Lake Ontario or any other watercourse or body of water.
5. That for the first installation, not less than twelve (12) of the Imhoff tanks with the corresponding sludge beds shall be constructed.
6. That whenever required by the State Commissioner of Health complete detailed plans satisfactory to this Department for more complete treatment of the sewage of the city of Rochester shall be submitted to the Department for approval: and that any or all portions of the sewage disposal works shown by said plans shall thereafter be constructed and put in operation when required by the State Commissioner of Health.

7. That the granting of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.

SANTA CLARA (Bull Point Camp)

Plans for a sewage disposal plant consisting of a settling tank, roughing filter and three intermittent sand filters to care for the sewage from the property of Mr. Henry Goldman at Bull Point on Upper Saranac lake in the town of Santa Clara, Franklin county, were submitted for approval on December 30, 1913, and were approved on January 13, 1914.

The report on the examination of plans and the conditions of the permit issued in connection with their approval follow.

Plans for sewage disposal for the property of Mr. Henry Goldman at Bull Point on Upper Saranac lake in the town of Santa Clara, Franklin county, were submitted to this Department for approval by the designing engineers on behalf of the property owner on December 30, 1913.

The property is a summer camp located on the peninsula projecting into Upper Saranac lake and comprises a small cottage, dining-hall, main cottage, guide house, annex and boathouse. According to the report of the designing engineers the summer population will be about twenty, with a winter population of four. The water supply which is taken from Saranac lake on the opposite side of the peninsula from the sewage disposal plant and about 1,900 feet from the point of discharge of the same, is estimated at 4,000 gallons per day during the summer, and 800 gallons per day during the winter, equal to a daily per capita rate of 200 gallons.

The sewage from all the buildings except the boathouse is to be collected and conveyed by gravity flow to the proposed disposal plant. The sewage from the boathouse is to be pumped into one of the manholes of the gravity system through a 3-inch galvanized iron force main by means of an electrically driven centrifugal pump to be submerged in the pump well. It is planned to start the pump by means of a hand switch. A float in the pump well is to operate a water level indicator placed on the outside of the pumphouse as well as an automatic stopping device placed on the inside of the pumphouse by means of which the hand switch is to be thrown out and the pump stopped when the sewage has been drawn down to a predetermined level.

It is proposed to treat the sewage from this property in a sewage disposal plant consisting of a settling tank, roughing filter and three intermittent sand filters. The settling tank and roughing filters which are to be covered are to be situated about 300 feet from the main group of buildings and the sand filters some 400 feet further from these buildings. The main sewer from the buildings to the settling tank is to be a 6-inch vitrified tile sewer laid on a slope of 1.0 per cent. The sewer between the settling tank and the sand filters is also to be constructed of 6-inch vitrified tile pipe laid on 0.73 per cent. slope. These sewers if properly constructed should be adequate as to sizes and capacities to satisfactorily care for the sewage of the property.

The proposed settling tank is to be divided into two compartments, the larger of the two compartments to be used in the summer and the smaller one in the winter. The larger compartment will give a detention period of 17 hours and the smaller compartment about 30 hours' detention of the sewage on the basis of design used, namely, 4,000 gallons and 800 gallons per day.

The roughing filter which is to be used in the summer only is to be a covered concrete structure 21'x9¾' in plan inside dimensions. It is to be filled to a depth of 18 inches with broken stone ranging from 2 to 3 inches in size. When the roughing filter is in operation the clarified sewage from the larger settling tanks is to flow into the distributing system consisting of lines of 4-inch tiles laid with open joints on the bottom of the filter. When the filter is filled with sewage to a certain depth it will be drained to the proposed sand filters by the discharge of an automatic discharge siphon of the Miller type located in the small dosing chamber connected with the collecting system and the roughing filter.

It is apparent that the roughing filter in addition to aiding somewhat in the purification of the sewage will also act as an auxiliary dosing tank and will increase the size of each dose applied to the sand filters by the capacity of the voids of the broken stone of the filter. On the basis of sewage flow used in the design, namely, 4,000 gallons per day, the sewage will be applied to the roughing filter at the rate of about 850,000 gallons per acre per day or at the rate of 425,000 gallons per acre daily based on a per capita daily rate of water consumption of 100 gallons. This is equivalent to a rate of 280,000 gallons per acre daily per foot of depth on a basis of 100 gallons per capita. It should be noted that this filter is not a roughing filter in the sense of the term ordinarily employed since it is to operate as an upward-fill contact filter and the effluent is not to be passed, either downward or upward, entirely through the filtering material as is usually the case with filters whose primary function is that of straining out suspended matter. Furthermore with the relatively high rate of operation of this filter as compared to the usual rates of operation of contact filters and considering the rather coarse material of which it is to be constructed, it will be of comparatively little value in the reduction of the sewage. Some clarification of the tank effluent will undoubtedly occur, but the filter, even though made up of a coarse medium will tend to clog at the rate at which it is to be operated and may require frequent cleaning, especially if it were to be operated throughout the year.

As already noted it is proposed to treat the effluent from the roughing filter in the summer and the effluent from the small settling tank in the winter on three sand filters so arranged that the sewage may be applied alternately to the different filters. The filters shown have a combined superficial area of 2½ feet with sand having an effective size of from 0.30 to 0.40 mm. Below the sand and surrounding the underdrains is to be a 6-inch layer of gravel ranging from ¼ to ½ inch in size. Above the sand covering and surrounding the distributing system is to be placed a similar layer of gravel and sand one foot thick.

The distributing system is to comprise parallel lines of 5-inch horseshoe tiles laid with open joints on 3-inch by 6-inch hollow terra cotta block tiles. The lines of distributing tile will extend from the main distributing channels and are to be spaced 3 feet apart, center to center. The collecting system is to consist of parallel lines of 4-inch drain tiles spaced 6 feet apart and connecting with a 6-inch collecting drain running diagonally through the bottom of each filter bed. Heavier embankments than those shown by the plans, extending entirely around the sand filter beds and built up a foot or more about the surface of the filters, should be constructed in order to prevent overflow into the lake in case of temporary clogging of any portion of the filters.

The effluent from the filters which are to be operated at an average rate of 30,000 gallons per acre per day during the summer and 6,000 gallons during the winter on the basis of a per capita rate of sewage contribution of 100 gallons per day is to be discharged into Saranac lake at a point about 20 feet from the shore through a 5-inch pipe. The upper portion of the pipe is to be of vitrified tile and the lower portion extending into the lake is to be of cast iron. The point of discharge which is located on the opposite side of the peninsula from the intake of the water supply of the property is about 1,900 feet from the intake.

From our careful examination of the plans it is found that the proposed sewage disposal plant if properly constructed and operated should produce a satisfactory effluent and one that may be safely discharged into the lake without objection at this time. I would, therefore, recommend that the plans be approved and a permit be issued allowing the discharge into Saranac lake of effluent from the proposed sewage disposal plant.

ALBANY, N. Y., *January* 12, 1914

PERMIT

A permit containing the following conditions was issued in connection with the approval of the plans on January 13, 1914:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary.
2. That the issuance of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.
3. That both the sewers and the sewage disposal plant shown by plans approved this day shall be fully constructed in complete conformity with such plans or approved amendments thereof.
4. That only sanitary or domestic sewage and no storm water or surface water from grounds, roofs or other areas shall be admitted to the proposed sewers.
5. That no sewage sludge from any part of the disposal works shall be discharged into Upper Saranac lake or any other watercourse or body of water.

SCARSDALE (Sewer District No. 1)

Plans for a proposed sewer in Rochambeau road in sewer district No. 1 of the town of Scarsdale were approved on July 1, 1914, and on October 13, 1914, plans for sewers in Popham Tract were approved. Plans for sewer extensions in Green Acres and the McCabe Tracts of this sewer district were approved on December 18, 1914. All of the proposed sewers provided for by these plans are tributary to the existing sewer system which discharges into the Bronx valley sewer.

The reports on the examination of plans follow.

Plans for sewer extensions in sewer district No. 1 of the town of Scarsdale, Westchester county, were submitted to this Department for approval.

A duplicate set of plans for sewers in Rochambeau road were first submitted on June 23, 1914, by Mr. David Welch, owner of the "Walnut Grange" development in which the sewers are located. Mr. Welch was advised, however, that it would be necessary to have the plans submitted by the sewer commissioners of the sewer district in accordance with the Town Law requirements. An application signed by the sewer commissioners was accordingly received on June 30, 1914.

The plans provide for two comparatively short 8-inch sewers in Rochambeau road one of which is tributary to the sewer in Church lane and the other to the sewer in Old Orchard lane for which plans were approved by this Department on December 27, 1913. The sewers are shown with slopes sufficiently steep to provide self-cleansing velocities under ordinary conditions and manholes are to be constructed at all points of change of slope and alignment.

It appears from an examination of the plans that the sewers if properly constructed should satisfactorily care for the sanitary sewage of the section to be served by them and I would, therefore, recommend that the plans be approved.

ALBANY, N. Y., *July* 1, 1914

These plans were accordingly approved on July 1, 1914.

Plans for proposed sewer extensions and modifications to the plans for sewerage in sewer disrtcit No. 1 of the town of Scarsdale, Westchester county, were submitted for approval. Sewer district No. 1 is located in the western part of the town of Scarsdale on the Bronx river.

The plans provide for proposed sewers in the so-called Popham Tract, near the Scarsdale R. R. station, tributary to the existing 12-inch outlet sewer which empties into the Bronx Valley sewer between manholes 76 and 77 about 300 feet south of Popham road. The plans show comparatively short sewer extensions in Meadow road, East Parkway, and East and West Parkway and in this tract and provide for a modification of the plans for sewers in the Old (Crane) road, Chase street and Popham road. According to the report of the designing engineers, modifications in the plans for the sewers in the latter streets were found necessary after having careful surveys made of the adjoining properties for the purpose of determining the required depths of the sewers for house connections. The proposed modifications comprise changes in grades, slopes and other details but do not decrease the efficiency of the sewers.

All of the proposed sewers which are to be constructed of 8 and 10-inch pipe, are to be laid with slopes sufficiently steep to produce self-cleansing velocities in them under ordinary conditions and if properly constructed should satisfactorily care for the sanitary sewage of the proposed tract. I would therefore, recommend that the plans be approved.

ALBANY, N. Y., *July* 1, 1914

These plans were accordingly approved on October 13, 1914.

Plans for proposed sewers in sewer district No. 1 of the town of Scarsdale, Westchester county, were submitted to this Department for approval by the Sewer Commissioners on December 2, 1914.

Original plans for sewerage for this sewer district were approved on December 27, 1913. The greater portion of this sewerage system is directly tributary to the Bronx Valley sewer.

The plans now submitted provide for comparatively short sewers in the so-called Green Acres and McCabe tracts. A note on the original plans indicates that the design of the sewers in these undeveloped tracts was tentative and subject to changes and that plans showing proposed changes would be submitted for approval at a later date. The present plans show the final design for sewers in Huntington and Brite avenues in these tracts.

The datum plans used in the design of the original plans and the present plans are not the same. According to advices received from the designing engineer 146.33 must be added to the elevations shown on the present plans to reduce them to the same datum as that used in the original design.

The proposed sewers are to be tributary to the trunk sewer in Fenimore road which discharges into the Bronx Valley sewer at manhole No. 53. All of the sewers are to be 8 inches in diameter and they are to be constructed with slopes of from .5 per cent. to .10 per cent. Manholes are to be placed at all points of change of slope and alignment and flush tanks are to be provided at the upper ends of all sewers except at the upper end of the proposed 100 foot section in Brite avenue where a manhole is to be installed in place of a flush tank.

From our careful examination of the plans it appears that the proposed sewers, if properly constructed, should be adequate as to size and capacity to satisfactorily care for the sanitary sewage to be tributary to them and I would therefore recommend that the plans be approved.

ALBANY, N. Y., *December* 14, 1914

These plans were accordingly approved on December 18, 1914.

SCHENECTADY

Amended plans for sewage disposal for the city of Schenectady were submitted for approval on July 6, 1914. The plans, however, were not in satisfactory condition for final acceptance and were, therefore, returned to the city authorities for modifications. Plans revised in accordance with the requirements of the Department were resubmitted on August 19, 1914, and approved on August 20, 1914.

The reports on the examination of plans follow.

Amended plans for sewage disposal for the city of Schenectady, Schenectady county, were submitted to this Department for approval by the department of public works of Schenectady on July 6, 1914. Application of the approval of the plans was received on March 26, 1914.

Original plans for the interception and disposal of the sewage of the city were approved by this Department on May 22, 1913. The proposed sewage disposal works provided for by these plans consisted of a screen and detritus chamber, settling tanks of the Imhoff type, sprinkling filters, final settling tanks, hypochloride treatment plant and auxiliary sludge tanks for the disposal of sludge.

The amended plans now under consideration were first submitted for approval on March 9, 1914, and showed that it was proposed to modify the preliminary settling tanks shown by the original plans by making them shallower and rearranging the settling and sludge compartments. It was stated by the village officials when these plans were submitted that the proposed changes were found necessary inasmuch as quick sand was encountered in making excavation for the tanks at elevation O.O. or at an elevation several feet above the bottom of the proposed tanks which made the construction of them as planned impracticable. The plans for the proposed modifications as first presented however, were not in satisfactory condition for approval and a number of conferences were held in this office with the Consulting Engineer, James C. Harding and the City Engineer, W. B. Landreth at which the modified design of the disposal plant especially the Imhoff tanks, was carefully considered.

These conferences also brought out the fact that the information with reference to the high water elevation of the Barge canal at the disposal plant site submitted with the original plan was incomplete and in some respects misleading. The original report which accompanied the plans stated that under the condition of the river existing at that time, i. e. before the completion of the Barge canal a high water elevation of 22 feet above mean low water would have to be provided for but that after the completion of the Barge canal the maximum high water level to be provided for would be 8.81 and inasmuch as it was believed by the designing engineer that the Barge canal would be in operation at the time of or soon after the completion of the disposal plant. No permanent provisions except by sterilization and by-passing portions of the works were made by the original plans for caring for the sewage during high water conditions in the river on the ground that elevation of the top of the sprinkling filters would be 9 feet above mean low water and about .2 feet above high water and the flow line of the settling tanks 14.40 above the mean low water mark and about 5 feet above the maximum high water elevation of the Barge canal. This would have meant that the operation of the sprinkling filters only would have been interfered with during high water conditions. Data recently submitted, however, show that elevation 8.81 will be the approximate maximum navigable stage of the canal and that extreme high water elevation as high as 22 or 23 feet above mean low water will probably be reached after the completion of the Barge canal.

Records recently submitted showing results of gaugings of the Mohawk river for a period of 11 months following the closing of the Vischers Ferry dam below Schenectady on July 12, 1913, which dam determines the low water elevation of the river or canal show that for two days during this period the water was above the top of the proposed Imhoff tanks and for eight days it was above the top of the sprinkler filters. For a period of one month the average elevation of the river was 6 inches below the top of the sprinkler filters and for only 7 months was the river below the bottom of these filters. It was evident, therefore, that it would be necessary to provide for the operation of the disposal works other than by sterilizing and by-pasing all or a portion of the works for a considerable period of each year and the city authorities were so advised. Two complete duplicate sets of plans modified in accordance with requirements of the Department and providing for pumping the effluent from the sprinkler filters during high water conditions were accordingly received on July 6. These plans also provide for an earth levee or dike 15 feet wide at the top with slopes of 2½ to 1 to be constructed around 3 sides of the plant, the towpath of the Erie canal forming the 4th side.

The top of the dike is to be at elevation 23 which is also the elevation of the towpath at this point and should be adequate to protect the plant from high water except perhaps during extreme high water conditions provided the dike is properly constructed and the outer slopes properly protected. According to a letter received from the city engineer on July 28, it appears that the present dike around the sewage disposal works was in place during the last spring floods and that the portion of the dike where the largest amount of scour would be likely to occur was above the flood. The city engineer also stated that an examination of the dike after the flood showed that no scour had occurred on the river side of the dike and he attributes this to the width of the river at this point and to the existence of a row of large trees between the river and the dike. I am of the opinion, however, that any permit issued to the city in connection with the approval of plans for sewage disposal should require that the river side of the dike shall be protected if found necessary in the future.

The settling tanks provided for by the original plans were divided into three sets or groups of six tanks each making a total of 18 tanks. Each of these tanks was to be 64 feet long by 22 feet 7 inches wide inside dimensions of the top portion of the tank and 22 feet 10½ inches deep with a depth of 21 feet 4½ inches from the flow line to the bottom of the sludge hoppers. Each tank was divided by means of partition walls into two upper settling compartments and five lower hopper shaped sludge compartments. The total settling capacity of these tanks was 1,500,000 gallons, equal to an average flow of about three hours for a daily flow of 12,000,000 gallons which was the basis used in the design. The sludge storage capacity of the tanks was about 81,000 cubic feet.

The plans now submitted and under consideration were prepared by Mr. James C. Harding, Consulting Engineer, and show that it is planned to make the settling tanks about 8.75 feet shallower than the tank provided for by the approved plans. Although the elevation of the flow line of the tanks is to be practically the same as originally planned, the tops of the tanks are to be about ¾ of a foot higher than originally planned and the bottom of the modified tanks will be slightly above elevation O.O. The plans also provided for a modification of the design of the sludge drying beds and for the temporary omission of the final settling tanks as well as for the omission of the screen and detritus tanks.

The proposed settling tanks are to be divided into six sets or groups of three tanks each or a total of 18 tanks. Each of the proposed tanks is to be 94 feet 8 inches long, 29 feet wide and 13 feet deep below the flow line and is to be divided into three settling compartments and eight double sludge compartments. The new tanks will have a total settling capacity of 1,500,000 gallons. The time of detention of the sewage in the new tanks will, therefore, be practically the same as for the old tanks or about three hours when treating a daily flow of from 11,000,000 to 12,000,000 gallons of sewage. The sludge capacity of the new tanks will be about 143,000 gallons as against 81,000 gallons of the original tanks and will, therefore, provide for a longer storage period of the sludge than originally planned for.

The design of the sludge compartments, however, differs somewhat from the original and usual design of sludge compartments. The original plans provided for five sludge storage chambers or compartments for each tank. Each sludge compartment was to be 12 feet 6 inches long and 12 feet wide with vertical sides and with bottoms in the form of truncated pyramids. The bottom portions of the chambers were designed with slopes of about 1 vertical to 2 horizontal and were to have a 1½-inch lead spray pipe with ¼-inch holes spaced 18 inches, center to center, laid around the inside of each hopper in order to facilitate the removal of sludge. In the present design the sludge compartments are divided by means of vertical walls into sections 11 feet 3 inches long and 11 feet wide below the slots. Each chamber is to have a flat bottom 2 feet wide by 11 feet 3 inches long with 2 lateral sides having slopes of 1 vertical to 1¾ horizontal. No spray pipes are shown in the proposed chambers and I am of the opinion that with the proposed design of the sludge compartments, with only 2 sloping sides for each compartment, it would be found difficult if not impossible to remove the sludge from the ends of the tank near the vertical partition walls unless some means be provided for loosening the sludge during cleaning or special precaution be taken to loosen the sludge by mechanical means during its removal.

It was originally planned to dispose of the sludge from the settling tanks either in covered sludge drying tanks or on open sludge drying beds. The open sludge beds were to be divided into 3 sets of 6 beds each having a total combined area of 26,000 square feet which was deemed to be adequate to care for the sludge to be derived from the sewage of a population of about 80,000 persons, the estimated population of the city at the time of the approval of the original plans.

The present plans provide for 2 sludge drying beds, 140 feet by 95 feet in plan. Each bed is to be divided by means of plank partitions into 4 beds 35 feet by 95 feet each giving a total area of 6,600 square feet which is slightly in excess of the area of the original beds. It is probable, however, that owing to the recent rapid growth of the city, these sludge drying beds may be found inadequate to properly care for the sludge and that they will have to be extended in the near future.

The bottom of each of the proposed beds is to be ridged slightly and lines of 8-inch main drains spaced 35 feet apart are to be laid in the low portions of the bed between the ridges. Three inch underdrains spaced 6 feet apart are to be connected with the main 8-inch underdrains which in turn discharge into the effluent channels of the sprinkling filters. The filter material of the beds is to consist of sand and gravel arranged as follows from the top down: a ¼-inch layer of mortar sand, 2 inches of 1/16 to ¼-inch gravel, 5 inches of ¼ to 1-inch gravel and a bottom layer of from 5 inches to 8 inches deep composed of gravel from 1 to 2½ inches in size.

With respect to the sprinkling filters it appears that no modifications have been made in the design of these structures. Application is made, however, for permission to omit the construction of the final settling tanks situated in the operating gallery of the filters on the ground that they are unnecessary at present and since it would be difficult and costly to construct them inasmuch as the hopper shaped bottom of these tanks are below elevation 0.0 at which quicksand was encountered during excavation at the disposal plant site. It is stated by the city engineer and architect in his letter transmitting the plans that "on account of the elevation of the ground about the works, it would be extremely difficult and costly to construct these tanks in any location other than that shown by the original plans". It is, therefore, proposed to construct the floor of the filter galleries in such a way that 8-foot sections of the floor may be removed leaving reinforced concrete struts 9 feet 3 inches center to center to protect the walls of the galleries during construction should it be required that the final settling tanks be constructed in the future.

Under ordinary operating conditions the effluents from the sprinkling filters will be discharged through two 42-inch effluent pipes directly into the river. During high water conditions, the effluent will be pumped. One pumping station is to be located on each of the two effluent pipes from the sprinkling filters. The easterly pumping station will also handle the surface water which will fall on the area inside the dike at times of storm.

This station is shown to contain three centrifugal pumps located in a dry well adjacent to the effluent pipe with the suction pipes of the pumps connected with the effluent pipe above the 42-inch sluice gate on this line. The pumps are to discharge into a chamber which connects with the effluent pipe below the sluice gate. According to a note on the plans and the letter recently received from the city engineer the pumps are to have sufficient capacity to handle all of the treated sewage and the surface drainage within the dike so that the plant can be operated without interruption during all stages of the river. This, however, is not definite enough and the sizes and capacities of the pumps as well as the nature and horse power of motive power should be shown or marked on the plans.

The plans also show details of the chemical house and sterilizing devices which according to the report submitted with the original plans was to be constructed to provide against the interference with the normal operation of the disposal plant by high water or other unavoidable causes. Provisions were made by the original plans for sterilizing the raw sewage, the effluent from the Imhoff tanks or the effluent from the sprinkler filters as found necessary. It was also stated in the original report that for the application of hypochlorite of lime, the chemical house would be built with pipe connections to the grit chamber, dosing chambers and final settling tanks and that if liquid chlorine was to be used, the apparatus would be installed in the filter galleries.

The plans now submitted for the chemical house and hypochlorite treatment plant including mixing and solution tanks are the same as those already approved. Inasmuch as it is now planned to provide against the interference with the operation of the plant during high water stages of the river by pumping the final effluent instead of treating the sewage with hypochlorite and by-passing portions of the works as originally planned, the city engineer and the architect was asked to submit a statement as to the proposed uses of the hypochlorite plant. It appears from the reply received from him that although the chemical house is to be constructed as planned it is proposed to use chlorine in the form of a compressed gas instead of as a solution of hypochlorite. The city should therefore, submit plans for the proposed chlorine applying device before it is installed since it is not shown by the present plans.

As noted above the plans now submitted do not show the grit and screen chamber provided for by the original plans. According to the supplemental report recently received from the city engineer and architect it is not considered necessary by him to construct the grit and screen chamber at present and it is not proposed to install this portion of the works until some time in the future if found necessary on the ground that the city sewer system is a separate system and since the trunk sewer leading to the sewage disposal works is about two miles long and has a very flat slope.

Although the Schenectady sewer system was designed as a separate system it has been found that it receives considerable storm water through storm water inlets which have been connected with the sanitary sewers. Considerable sand and gravel does in all probability also reach the sewers during times of storm through perforated manhole covers and inasmuch as the trunk sewer is planned with slopes sufficiently steep to produce self-cleansing velocities, I believe that a large portion of the grit entering the lateral sewers will reach the disposal plant. There are, moreover, always considerable quantities of coarse material of all kinds in sanitary sewage of cities of this size which, if not removed by screening, would in all probability interfere with the operation of disposal works, especially those involving the Imhoff tank treatment and I am of the opinion that it is essential to the successful operation of the proposed sewage disposal works that a grit and screen chamber as provided for by the original plans should be installed and that plans for the same should be submitted for approval.

From our careful examination of the plans, it appears that the proposed sewage disposal plant, if properly constructed and if operated with care and efficiency should satisfactorily care for the sewage of the city of Schenectady. There are, however, certain details and omissions as follows, which should be supplied before the plans will be in final shape for acceptance:

1. The plans should show the capacity and sizes of the pumps at the pumping station.
2. The plans should show the nature and horse power of the motive power to be used to drive the pumps at the pumping station.
3. Detailed plans of a suitable grit and screen chamber should be submitted for approval.

I would, therefore, recommend that the plans be returned to the city authorities for revision or modification in accordance with the above requirements.

ALBANY, N. Y., *August* 4, 1914

These plans were accordingly returned for modifications on August 7, 1914.

Amended plans for sewage disposal for the city of Schenectady, Schenectady county, were submitted to this Department for approval on August 19, 1914.

Our examination of the plans now submitted show that they have been prepared in accordance with all of the above recommendations and show that the proposed grit and screen chamber, shown by the original plans approved on May 22, 1913, is to be constructed without any modifications of the same and should provide for a satisfactory means of preliminary treatment of the sewage prior to its discharge into the proposed Imhoff tanks.

The plans now show that the pumping stations at the disposal works are to be equipped with two 10,000,000 and one 5,000,000 gallons centrifugal pumps. Although it appears that the motive power to be used to drive the pumps has not been definitely determined upon, the plans indicate that the pumps are to be operated either by electric motors or by two 65 horsepower and one 30 horsepower gasoline engines. It appeared, therefore, that the pumping equipment at each of the two stations should be of adequate capacity to handle about twice the present average flow of sewage.

It was stated by the deputy city engineer at this office on August 18, that if the city decides to use electric power at the pumping stations there will be adequate assurance that there will be a continuous operation of the pumps when needed inasmuch as the local electric company which is controlled by the General Electric Company, receives power from Spier Falls, Schaghticoke and Mechanicville and that in case of a break down of any or all of these sources of power the General Electric Company has a steam plant of adequate capacity to furnish as much electric power as is derived from the above sources.

In view of the above I would recommend that the plans be approved. It should not be necessary, however, to issue a permit in connection with approval of these plans inasmuch as the permit granted to the city on May 22, 1913, allows the discharge of effluent from the proposed sewage disposal works to be constructed in conformity with plans approved that day or approved amendments thereon.

ALBANY, N. Y., *August* 20, 1914

These plans were approved on August 20, 1914.

SCHENECTADY COUNTY TUBERCULOSIS HOSPITAL

Plans providing for the abandonment of the existing subsurface irrigation system and for the installation in its place of a sprinkling filter, final settling tank, dosing tank and sand filter to treat the sewage of the Schenectady Tuberculosis Hospital at Glenridge were submitted for approval on October 1, 1914, but were returned for modifications on October 8, 1914, inasmuch as they were not in satisfactory condition for approval. Plans revised in accordance with requirements of this Department were resubmitted on October 20, 1914, and were approved on October 22, 1914.

The reports on examination of these plans together with the conditions of the permit issued in connection with the approval of them follow.

Amended plans for sewage disposal for the Schenectady County Tuberculosis Hospital were submitted to this Department for approval on October 1, 1914.

The records of the Department show that plans for sewage disposal consisting of a settling tank, dosing tank and underdrained subsurface irrigation system designed to care for an ultimate population of sixty persons were approved by this Department on May 17, 1911. The sewage disposal plant provided for by these plans was constructed and put in operation during the spring of 1912. It appeared, however, from an inspection of the plant made by a representative of this Department on May 1, 1914, that difficulty was experienced in the operation of the plant due to the clogging of the underdrains and distributing system of the subsurface irrigation field during the summer of 1913 and that in the fall of that year the entire distributing system was relaid.

The inspection of the plant this year showed that in the laying of the distributing system proper care had not been taken to protect the joints by covering them with tar paper or other material with the result that the tile pipe composing the distributing system had become filled up and in many places inoperative, that the settling tank was somewhat smaller than that provided for by the plans, that the tank was nearly filled with sludge and scum, not having been cleaned out for some time and that the entire plant was overtaxed and operated at a considerably higher rate than that for which it was designed due to an increase in the population served by it of about 35 per cent. over that originally estimated. The county authorities were accordingly advised to relay the distributing system properly and extend it so as to care for the increase in the population which had taken place or if they desired to modify the present type of plant they were advised to employ a competent engineer to study the problem, prepare plans and present the same to this Department for approval.

The plans now submitted show that the latter alternative has been followed and that it is now proposed to abandon the subsurface irrigation system and install in its place a sprinkling filter, final settling tank, dosing tank and sand filter and to cover the entire plant with a frame building. The existing preliminary settling tank and dosing chamber are to be retained without modification. It was stated by the superintendent of the institution who presented the plans that the new plant had been designed to care for an estimated ultimate population of 100 persons.

The existing settling tank will give a time of detention of about 3½ hours when serving 100 persons assuming a per capita rate of sewage contribution of 100 gallons per day. This tank, as noted above, was designed to care for a maximum population of 60 persons and if it had been constructed in complete conformity with the plans it would have given an average detention of 8 hours for the sewage contributed by this population. The tank, however, is somewhat smaller than planned for and the estimated future population to be served by it is nearly 70 per cent. greater than originally estimated. It is important, therefore, that the tank be properly operated and that the sludge be removed from it at regular intervals of say, not more than two months in order that the accumulation of sludge in the tank may not materially reduce the settling capacity of the tank and thus reduce its efficiency.

From the settling tank the clarified effluent is to be discharged into the existing dosing tank located adjacent to the settling tank. The dosing tank is provided with an automatic discharge siphon of the Miller type by means of which the effluent is to be discharged into the distributing system of the proposed sprinkling filter. Assuming that the siphon has a drawing depth of 30 inches, it will discharge about once every hour when the flow of sewage amounts to 10,000 gallons per day. I am of the opinion that the time between doses is too long and that the size of the dosing chamber should be reduced in order to provide for a more uniform flow of the sewage through the final settling tank.

There appears to be a discrepancy in the plans in the elevations of the settling and dosing tanks and the invert elevation of pipe leading from the dosing tank to the sprinkling filter. The bottom of the settling tank is marked 90.5 and the invert of the line leading from the dosing tank 95.3 which would be nearly 5 feet above the bottom of the tank and only about one foot below the invert of the inlet, to the settling tank. The original plans show the bottom of the settling tank and the dosing tank at the same elevation and the outlet from the dosing tank about one foot lower. Assuming that the elevation of the bottom of the tank is correct the elevation of the invert of the outlet from the dosing chamber would be about 89.5. This, however, would make the outlet to the dosing tank 1½ feet lower than the nozzles of the sprinkling filter and would provide for a maximum static head on the nozzles of only 2.5 feet assuming that the siphon has a 30-inch draft.

The proposed sprinkling filter is to have a superficial area of 380 square feet and is to be filled to a depth of 6 feet with broken stone placed above a false floor underdrain system consisting of 6-inch half tiles spaced 11 inches center to center. The under drains are to be surrounded with stones varying in size from 3 to 5 inches and the remainder of the filtering material is to consist of stones from one to two inches in size. The distributing system is to consist of a 4-inch wrought iron pipe and four 3-inch wrought iron riser pipes to which are to be attached four square spray nozzles. The settled effluent will be applied to the sprinkling filter through the nozzles at the rate of about 1,500,000 gallons per acre per day on the basis of design used.

The effluent from the sprinkling filter is to be discharged into a final settling tank where it will be subject to a subsidence period of about 1⅔ hours before it passes into the dosing tank connected with the sand filter. Provisions are made for drawing off the sludge from the final settling tank and discharging it to a sludge bed through a 6-inch pipe provided with a valve connected with the bottom of the tank.

The proposed dosing tank is designed to discharge the settled sprinkling filter effluent intermittently to the distributing troughs of the sand filter under a head of from 1¾ to 3¾ feet. Each dose is equal to about 22 cubic feet and would cover the sand filter as planned to a depth of only about one-quarter of an inch. I am of the opinion that such a small dose would not be adequate to give a uniform distribution over the entire surface of the filter and that each dose should be sufficient to cover the sand filter to a depth of not less than one-half inch.

The sand filter is planned to have an area of about 1,000 square feet and is to be filled to a depth of 2.2 feet with sand and gravel or broken stone. The sand is to have an effective size of from 0.35 to 0.47 millimeters. The gravel or broken stone is to be placed on the bottom of the bed and around the tile collecting pipe. The bed is to be underdrained with lines of 6-inch open ring tiles spaced 6 feet apart. The top of the tiles is shown at an average depth of 2.2 feet below the top of the sand. The joints of the underdrains are protected by a 6-inch layer of gravel or broken stone varying from one-quarter to three-quarters inches in size. If the filter is constructed as planned the net depth of the sand would be less than 2 feet over the covering of the underdrains. I am of the opinion that the sand layer should not be less than 2.5 feet deep at any point.

When serving the estimated population of 100 and assuming a per capita rate of sewage contribution of 100 gallons per day the sand filter will be required to operate at the rate of about 435,000 gallons per acre per day. This rate of operation is entirely too high for filters of this type even when treating sprinkling filter effluent. I am of the opinion that in general sand filters under the proposed conditions should not be operated at more than 300,000 gallons per acre per day unless under expert supervision and this requirement is especially necessary in the case of institutional plants. The filter should also be divided into three or preferably four beds and provided with proper dosing facilities for dosing the beds alternately, so arranged as to permit of throwing any one of the beds out of use when necessary for cleaning or resting.

In conclusion I would state that it appears from our examination of the plans that the proposed sewage disposal plant has, in general, been designed to meet the local requirement for sewage disposal for the institution. The plans, however, should be modified in the following respects:

1. The size of the existing dosing chamber should be reduced and the proposed method of making such change should be shown by the plans.
2. The apparent discrepancy in the plans with reference to the elevations of the different portions of the existing settling tank and dosing chamber should be corrected and the proposed works should be designed to conform therewith.
3. The sand filter should be divided into three or preferably four beds and should be provided with proper dosing devices so arranged as to dose

the beds alternately and permit of throwing any one of the beds out of use when necessary.

4. The sand layer comprising the filtering material of the proposed sand filter should at no point be less than 2.5 feet deep.

In view of the results of our examination of these plans and after careful consideration of the essential features of the design and of local and general requirements for sewage disposal from the institution I would recommend that the plans be returned for modification in accordance with the above requirements.

ALBANY, N. Y., *October* 6, 1914

The plans were accordingly returned for modification on October 8, 1914.

Amended plans for sewage disposal for the Schenectady County Tuberculosis Hospital at Glenridge were again submitted to this Department for approval on October 20, 1914.

The plans now submitted show that they have been revised in general accordance with all of the above recommendations and that it is proposed to remove the wall between the existing settling tank and dosing tank and to use the dosing tank as a part of the settling tank thus increasing the detention period from 3½ to 4½ hours when serving an estimated future population of 100 persons on the usual assumption as to per capita rate of sewage contribution. It is stated by the designing engineer that if sufficient funds are available it is proposed later to substitute a settling tank of the Imhoff type for the present plain settling tank and to submit plans for such modifications at a later date.

The plans also show that it is proposed to construct a small dosing tank adjacent to the existing dosing tank to feed the sprinkling filter. This tank has a capacity of 135 gallons and is provided with a 5-inch discharge siphon of the Miller type having a draft of 4 feet. This siphon is to discharge intermittently at intervals of about 20 minutes, on the basis of design used, into the distributing system of the sprinkling filters under a maximum static head of 5.5 feet.

The proposed sand filter is to be divided into four parts by means of partition walls extending to the top of the underdrains in the filter and the discharge pipe from the dosing tank is to be provided with four valves by means of which alternate flow to the different beds may be obtained. The size of the filter, however, is to be the same as shown by the original plans except that the depth of the sand layer has been increased to 2.5 feet as recommended. As pointed out in my former report the size of the sand filters does not appear to be large enough to care for the ultimate population and will probably not care for more than 75 persons so that when the present population materially exceeds 75, it will in all probability be necessary to increase the size of the sand filters. The report of the designing engineer states that there is now a total of 60 persons at the institution, so that the plant as now designed should allow for a slight increase in population. The settling tank and sprinkling filter portions of the plant, however, should be of adequate capacity to care for the sanitary sewage for a population of about 100.

In conclusion I would state that it appears from from our examination of the plans that the proposed sewage disposal plant if properly constructed in accordance with the plans and if operated with care and efficiency should satisfactorily care for the sanitary sewage from the institution. It is essential, however, to the succesful operation of sewage disposal plants to have them at all times under constant supervision of an intelligent operator and the institution authorities should be advised to provide for the proper maintenance and operation of the plant.

In view of the above, I would recommend that the plans be approved and a permit be issued allowing the discharge into a tributary of Alplaus creek within the town of Glenville of effluent from the proposed sewage disposal plant and that the permit contain in addition to the usual revocation and modification clauses the condition that the sewage to be passed through the disposal plant shall be limited to that contributed by 75 persons.

ALBANY, N. Y., *October* 21, 1914

PERMIT

A permit containing the following conditions was issued in connection with the approval of the plans on October 22, 1914.

1. That this permit shall be revocable at any time or subject to modification or change when in the opinion of the State Comissioner of Health such revocation, modification or change shall become necessary.
2. That the issuance of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.
3. That the sewage disposal works shown by plans approved this day shall be fully constructed in complete conformity with such plans or approved amendments thereof.
4. That only sanitary or domestic sewage and no storm water or surface water from grounds, roofs or other areas shall be admitted to the proposed sewers.
5. That the sewage to be passed through the disposal plant shall be limited to that contributed by 75 persons.

SCOTIA

The proposition submitted by the village authorities under Section 20–A of the Public Health Law to construct sewers in Hawk, Wilmarth and other streets of the village of Scotia was approved on June 27, 1914, on condition that before the construction of the proposed sewers, the plans therefor shall first be submitted to this Department for approval.

SLOAN

Plans for sewerage and sewage disposal for the village of Sloan were submitted for approval on February 23, 1914. The plans, after a careful examination of them and following an inspection of the village, were returned to the village authorities for modifications. Plans revised in accordance with the requirements of this Department and providing for a sanitary sewer system and a sewage disposal plant consisting of a settling tank of the Imhoff type, chlorination tank and sludge bed were resubmitted for on July 1, 1914, and were approved on July 16, 1914.

On November 24, 1914, plans for proposed sewer in Wagner and Atlantic avenues and Lovejoy street, in the village of Sloan, tributary to the Buffalo sewer system, were approved. The reports on the examination of the plans and the conditions of the permits issued in connection with the approval of the same follow:

Plans for a system of separate sewers and sewage disposal works for the village of Sloan, Erie county, were submitted on February 23, 1914, by the Board of Trustees and a formal application for their approval was made under date of February 19, 1914.

The records of the Department show that plans for a sewerage system for the village of Sloan were approved by this Department on February 28, 1908, but no permit was issued in connection with the approval of these plans because it was intended at that time to discharge the sewage into the sewers of the city of Buffalo. On April 22, 1908, permission was given to the Board of Sewer Commissioners to temporarily defer the construction of a part of the sewer system and on June 22, 1908, supplementary plans were submitted for a section not included in the original plans and approved by this Department. The plans now submitted were prepared by George C. Diehl, Civil Engineer of Buffalo, and comprise tracings and blue prints of the following sheets:

1. Four sheets forming a general map of the sewerage system.
2. Nine sheets of profiles, details and appurtenances of sewers.
3. Three sheets showing plan and detail of disposal works.
4. One blue print marked A-1 showing old channel of Little Buffalo Creek.

The report of the designing engineer states that flood conditions are produced in part of the village of Sloan due to the backing up of water in a small watercourse known as Little Buffalo Creek which flows in a westerly direction through the village. This creek is carried under the Delaware, Lackawanna and Western R. R. tracks near the Buffalo city line through a culvert which it is stated is of sufficient capacity to properly dispose of the maximum run-off from the watershed tributary to the stream above the culvert but is placed too high, thereby causing a backing up of the creek before the discharge commences.

The creek passes into the city of Buffalo, and the engineer states in his report that the city intends to construct, in the near future, a 72-inch storm sewer into which the waters of the creek will discharge. A paved channel is then to be built by the village and this channel will be roofed over when necessary. It is stated that it would not be practicable to discharge the sanitary sewage of Sloan into the sewers of Buffalo without pumping. Until such time as the Buffalo storm sewer is built, the sanitary sewage of Sloan is to be pumped into Little Buffalo Creek after treatment in the disposal plant.

The plans as submitted provide not only for a system of sanitary sewers and a sewage disposal plant but also for a system of storm sewers which also discharge into Little Buffalo Creek. The discussion in the following report concerns only the sanitary sewers, since this Department is not required by law to pass upon plans for systems of storm sewers.

The village of Sloan is situated just east of the city of Buffalo. It is provided with an unfiltered public water supply pumped from Lake Erie and the works are controlled by the Western New York Water Company, which furnished public water supplies to other nearby municipalities. The present population of the village, according to the census of 1910, is approximately 1,259. The present population of the portion of the village to be served by the proposed sewers is given as 500 in the engineer's report and its area is placed at 300 acres, giving a density of about 1.8 per acre. It is stated in the engineer's report that the southeasterly section of the village which is now built up, is cared for in another manner. Reference to the plans approved by this Department for Sewer District No. 1 in the town of Cheektowaga shows that provision has been made in these plans for the sewering of the southeast corner of the village of Sloan. An area of five acres in the southwest corner is said to be naturally tributary to the city of Buffalo. Sewerage facilities are thus provided for a total of 330 acres, leaving a balance of 260 acres for which no sewers are to be built. This balance of 260 acres is said to be occupied by railroad yards and factories and it would seem that some means should be provided for disposing of the sewage from the latter in a sanitary manner.

The increase in population of the village has been moderate and based on the engineer's estimate, it is believed that the populatio
contribute sewage from the sewer district will be a
the report of the designing engineer a daily per
of 60 gallons is assumed for a present popula
lation of 5,000, which gives a present flow

a future flow of 300,000 gallons per day. As the population of the village was given as 1,259 in 1910 and the present population of the 300 acres to be sewered is given as 500, the other 30 acres, which are now built up, would appear to have a population of about 700, unless the population of the village has materially decreased in these sections. This would give a density of about 23.3 per acre, which, applied to the 300 acres to be sewered, would give a future population of about 7,000. It is probable, however, that provision of sewerage facilities for a population of 5,000 will be sufficient for a considerable time in the future. In view of the fact that the village lies in a low region subject to floods, it appears that a considerable infiltration of ground water into the sewers would be expected, and as the village is a residential section, an estimate of 60 gallons of sewage per capita per day would be too low.

The plans have been carefully examined in respect to the sewerage system and sewage disposal works. In connection with the sewerage system the design has been carefully studied with reference to alignment, sizes, grades, capacities, facilities for cleaning and inspection and flushing and other features of a hydraulic or sanitary nature. In connection with means for sewage disposal it has been studied with reference to general method and efficiency of the sewage disposal plant as a whole, and of the capacities and practical operation of the individual structures, appurtenances and apparatus.

In a few instances, the sewers are shown within four feet of the ground surface and where the final grade is shown the sewers are placed within four feet of this grade. The 10-inch sewer in Franklin street has a slope as low as 0.25%, but as this is only a short lateral, clogging would probably be prevented by placing a flush tank at its upper end. A manhole has been placed at every change of grade or alignment in the sewer system, but no flush tanks appear to have been provided. The sizes of the sewers are apparently sufficient to care for the sewage which will be contributed to them and they are in nearly every instance laid on slopes sufficiently steep to provide self-cleansing velocities. The maximum spacing of manholes is about 500 feet, which is not excessive. A siphon is shown on the plans in Wagner avenue where the sewer is carried under Little Buffalo Creek, but no details of this siphon are shown.

It is proposed to treat the sewage collected by this system in a sewage disposal plant located upon the bank of Little Buffalo Creek, near the Buffalo city line, close to the corner of Wagner and Vanderbilt streets. This section is not extensively built up at present. Little Buffalo Creek has a drainage area above this point of approximately 1.6 square miles, consisting mostly of sparsely developed suburban subdivisions. The site for the sewage disposal plant, located as it is at the most western extremity of the village, close to the point at which the sewage of the village must naturally be discharged, if the effluent from the disposal plant is to be discharged into a natural watercourse, is apparently the best location available. The ground surface of the corporation is apparently very flat and it is, therefore, difficult to place the disposal plant at an elevation which at all stages of the creek will permit of the operation of the plant entirely by gravity.

Upon reaching the disposal plant, the sewage is first to be passed through a screening chamber, the location of which is shown on the plans. No details or descriptions of these screens are given on the plans or in the designing engineer's report, however. From the screening chamber the sewage is to pass into a circular Imhoff tank, apparently intended to have circumferential flow. A per capita sewage contribution of 60 gallons per day for a population of 5,000 has been used by the engineer in designing the plant, giving a total daily flow of 300,000 gallons. From an examination of the plans it would appear that it is the intention of the designing engineer that the sewage after entering the tank shall flow through an outer circular settling compartment thence passing through an opening into an inner circular settling compartment, around which it will pass to the outlet. It is evident that the note appearing on the plans with reference to the cutting away of the cylindrical partition in the settling tank is incorrect and that the arrows should show that the cylinder is to be cut away only between the inner ends of the baffles in the outer compartment and the outer end of the higher baffle in the inner compartment. In this discussion of the design of the tank it has been assumed that the cylindrical partition is to be cut away as described above.

The baffle over which the sewage is to flow on *entering* the outer settling compartment of the tank is shown to have a top elevation of 25 and the baffle over which the sewage is to flow on *leaving* the inner settling compartment of the tank to the outlet compartment, or section in which the outlet pipe is placed, is shown to have a top elevation of 25. The baffle placed at the head of flow of the inner settling compartment is shown to have a top elevation of 31 and a bottom elevation of 24.50, the same as the bottom of the outlet compartment, although the plans are rather meagre with respect to showing the constructive features at the outlet compartment.

Assuming that the elevations of the various weirs are as given, including the section of the cylindrical partition near the outlet compartment and assuming that the bottom of the outlet compartment is at elevation 24.50, with no connection being had between this compartment and the other compartments of the tank except over the outlet weirs of the inner compartment, the flow of sewage may be passed around the two circular, concentric compartments as designed, although it appears that no positive assurance is had that a portion of the flow in following the line of least resistance will not reach the outlet in a more direct route by passing through the slot from the outer compartment into the inner compartment.

The area of the cross section of the first settling compartment is about 40.5 square feet. Assuming an ultimate population of 5,000 and a per capita sewage contribution of 100 gallons per capita per day a velocity through the outer settling compartment of 0.02 feet per second is obtained. Since the area of cross section of the inner compartment is practically the same as that of the outer, the velocity through it will be the same. The two settling compartments have a combined capacity of about 4,660 cubic feet (i. e. 35,000 gallons), giving a period of detention in the tank of approximately 1.7 hours for the ultimate population of 5,000, assuming 100 gallons per capita per day.

The sludge compartment of the Imhoff tank has a volume of about 5,360 cubic feet, which should provide ample storage capacity for the sludge from the future population of 5,000 for a period of six months. Six gas vents are provided around the circumference of the tank.

The sludge is to be pumped from the sludge compartment of the disposal plant by means of a deep well or artesian pump and disposed of on a sludge bed consisting of two feet of graded stone covered by one inch layer of coarse sand. The sludge bed, which has an area of about 1,250 square feet, is underdrained by agricultural tile, the main underdrain discharging into the creek.

From the settling tank, the sewage is to pass into an aerating channel where air is to be blown into it from a series of perforated pipes connected with electrically operated fans. The sewage then passes through a baffled channel into a sterilization chamber, where chlorine is to be introduced into it. The details of the chemical application devices are not shown on the plans nor are they described in the report.

After sterilization, the effluent from the disposal plant is to be discharged into Little Buffalo Creek through an outlet pipe in which is located a wooden ball float so arranged as to close the outlet at such times as the waters of the creek would back up into the chlorine chamber. The effluent is then to flow over a weir into a pump well from which a pump automatically started will pump the sewage into the creek. Until the 72-inch Buffalo storm sewer is built and the paving of Little Buffalo Creek completed it will be necessary to pump the sewage into the creek.

The plans propose, therefore, a discharge into a creek tributary to the sewer system of the city of Buffalo of settled, aerated and sterilized effluent and that later when the proposed storm sewer shall be extended to the village line by the city, such effluent will be carried with the waters of Little Buffalo Creek into such storm sewer.

An inspection of Little Buffalo Creek and of the proposed disposal plant site by a representative of the engineering division on April 18, after and during a heavy precipitation of rain and snow, causing a heavy run-off, showed that the culvert under the D., L. & W. R. R. embankment referred to and the city sewer into which the greater portion of the flow of the stream discharges are inadequate to properly carry off the flow of Little Buffalo Creek during times of high water, inasmuch as an area east of the railroad 400 feet wide and about 1,200 feet long was inundated. An area of about an acre near the inlet to the sewer receiving the flow of the stream in the city west of the railroad culvert was also flooded at the time of the inspection, in spite of the fact that the surplus flow of the creek was carried southerly along Atlantic street in Sloan to a second box culvert 6 feet by 7 feet under the D., L. & W. tracks and thence under Lovejoy street through two 3-foot and 2-foot pipes to an open ditch along the foot of the D., L. & W. railroad embankment to Williams street in Buffalo, where the flow is taken into the city system. The upper end of the culvert was partially choked with cinders and refuse, so that this diversion of the surplus flow of the creek did not seem to materially relieve the flooded condition of the creek in Sloan. It was learned, however, from residents living in Buffalo near the other culvert referred to that, before the surplus flow of the creek was diverted near Lovejoy street, a large portion of the city between North Ogden street and the D., L. & W. R. R. embankment was flooded during every heavy freshet.

It appears, therefore, that, owing to encroachments of the channel of Little Buffalo Creek, both by the railroad and the city near Vanderbilt street, an inadequate capacity and grades of artificial channels constructed by the city of Buffalo to care for the flow of this stream, a large portion of both Sloan and Buffalo are flooded during times of heavy freshets. The Deputy Commissioner of Public Works of the city when seen by our engineer stated that the city is planning to construct a large storm water sewer to take a portion or all of the flow of Little Buffalo Creek and to act as a relief sewer for some of the combined sewers in the section of Buffalo between Little Buffalo Creek and Buffalo Creek, into which it is to discharge.

The construction of such storm water sewer, if the sewer is made sufficiently low at its upper end and if carried to the easterly city line, should not only prevent future inundations during times of storm of a large area in Sloan and Buffalo near the D., L. & W. railroad, but would also relieve the existing 39-inch sewer in Vanderbilt street, which now takes the larger portion of the flow of Little Buffalo Creek, and provide ample capacity for the sanitary sewage of the village of Sloan. It was learned from the city officials, however, that, although the proposed storm water sewer has already been designed, the time of the construction of this sewer has not been determined upon, inasmuch as it is to be constructed under a $2,000,000 bond issue, of which only $500,000 can be expended in any one year, and since there are a number of similar projects under consideration which require early attention, the one that is the most urgent will be taken up first.

It was also learned that negotiations were carried on with the village a number of years ago with reference to the discharge of sewage from the proposed village sewer system into the city sewer system but that these negotiations were later broken off. The Deputy Commissioner of Public Works of Buffalo stated that in his opinion the city would probably permit the village to connect with the 39-inch sewer in Vanderbilt street and discharge raw sewage into this sewer after the construction by the city of the storm water sewer referred to, provided satisfactory arrangements could be made with the village for the payment of a proportionate share of the cost of this outlet sewer and for a proportionate share of the cost of treatment of this sewage in connection with the treatment of the sewage of the city when required in the future.

Reviewing briefly the features of the proposed design for sewerage and sewage disposal for the village of Sloan it would appear, first, that from an engineering standpoint the plans are defective in that the sewer system does not cover the entire municipality as provided for by the Village Law; that details of construction of the Wagner street siphon and of the screening chamber and screens are not shown by the plans and that the type of plant proposed will not provide for adequate treatment of sewage under the conditions under which the discharge of effluent is to take place.

It appears, therefore, that the approval of the plans in their present form is undesirable considering the conditions under which the plant would be operated and the effluent discharged which would probably cause a nuisance and danger to health. It would seem that the plans should not be approved unless they provide for complete organic purification of the sewage.

It must not be overlooked that at the present time no sanitary sewers have been constructed in this district and it would seem that a proper solution of the problem of providing sewerage for the section would be to discharge it into the Buffalo sewer system to be treated, later, together with the sewage of the city of Buffalo, when that becomes necessary and required. This is amply provided for by Chapter 443 of the Laws of 1906.

In view of the results of our examination of these plans and after careful consideration of the essential features of the design and of local and general requirements and with respect to proper methods for the disposal of sewage from the proposed sewerage system and sewage disposal works, I beg to recommend that the plans be returned to the designing engineer for revision and amendments in the following respects:

1. That provision be made in the design of the system of sewers and sewage disposal works to furnish sewerage facilities for the factory district shown on the general map.
2. That details of construction of the Wagner street siphon be submitted.
3. That details of the screen chamber and of the screens be shown on the plans.
4. That provision be made so that a uniform, concentric flow through the tank be assured, or that a type of tank be substituted which will provide for translatory rather than concentric flow of sewage.
5. That instead of or in addition to the supplementary treatment provided by aeration of the present plans, additional works for more complete treatment of sewage be included in the design.

In conclusion I would suggest that if satisfactory arrangements could be made by the village of Sloan with the city of Buffalo for the disposal of the sewage contemplated by the present plans under the conditions suggested above with respect to future purification of the sewage by the city of Buffalo when necessary, that a more natural and logical solution of this problem would be attained than that provided for by the plans proposed.

ALBANY, N. Y., *April* 21, 1914

The plans were accordingly returned for modification on April 27, 1914.

Plans for sewerage and sewage disposal for the village of Sloan, Erie county, were resubmitted to this Department for approval by the board of trustees on July 1, 1914.

A conference with reference to the requirements of this Department for sewerage and sewage disposal for the village was held in this office on June 17 with the designing engineer and his assistant, and on July 1 detailed plans of the Wagner street siphon and of the screen chamber at the disposal plant were submitted for approval.

The designing engineer stated at the conference that the factory district of the village was included in the sewerage system and that provisions were made for connecting the factories with these sewers as soon as the system is completed. Both the sewer system and sewage disposal works appear to be of adequate capacity to include sewage from the factory district.

With reference to the rather unusual design of the settling tank, the village engineer stated that he had constructed a model of one of these tanks and found that the flow through it was concentric and uniform without the sewage being by-passed through the slot and that he thought that a large tank of similar design to the model would produce the same results. Although it is doubtful whether the same conditions would obtain in a large tank as in a small model it is probable that there would not be a sufficient amount of sewage by-passed through the slot to materially interfere with the operation of the tank. If, however, it is found that there is sufficient flow of sewage through the slot to interfere with the proper operation of the tank, a modification of the operating arrangements of the tank should be made.

The question of the degree of treatment provided for by the plans was also discussed at length. It was stated that any arrangement satisfactory to the village of Sloan could not be made with the city of Buffalo for connecting with the city sewer system, inasmuch as the city would not enter into an agreement with Sloan for the care of its sewage on a permanent basis, but would make only a temporary contract, as it has done in the case of other districts adjacent to the city. It was also stated that, in case the village should connect with the city sewers, it would require a continuous pumping of the sewage, whereas at the present time the plant could be operated without pumping except during storms. It appears also that the construction of the proposed relief sewer to care for the entire flow of Little Buffalo creek will be undertaken by the city in the near future and that until such sewer has been constructed the discharge of sterilized effluent would probably not create objectionable conditions provided the disposal plant is properly constructed and operated, inasmuch as there are at present no houses between the proposed outlet of the disposal plant and the point where Little Buffalo creek now enters the city sewer system.

With reference to the chlorination of the sewage it was stated in a communication received from the designing engineer on June 24 that, although the chlorinating apparatus had not been designed in detail, it is proposed to have it so designed as to discharge from 0.5 parts to 2 parts per million, depending upon the results and the condition of the sewage.

Satisfactory detailed plans of the chlorinating device should be submitted before the plant is constructed and not less than 15 parts of chlorine or not less than 15 parts of available chlorine per million parts of sewage created should be used in order to insure uniformly satisfactory results.

In view of the above, I would recommend that plans for the proposed sewer system and sewage disposal plant be approved and that a permit be issued allowing the discharge into Little Buffalo creek of effluent from the proposed sewage disposal plant.

ALBANY, N. Y., *July* 16, 1914

PERMIT

A permit containing the following conditions was accordingly issued in connection with the approval of the plans on July 16, 1914.

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary.
2. That the issuance of this permit shall not be deemed to affect in any way action by this Depaartment on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.
3. That both the sewer system and the sewage disposal works shown by plans approved this day shall be fully constructed in complete conformity with such plans or approved amendments thereof.
4. That only sanitary or domestic sewage, and no storm water or surface water from streets, roofs or other areas shall be admitted to the proposed sewers and sewage disposal works.
5. That before the construction of the sewage disposal works is commenced, satisfactory detailed plans of the chlorination device to be used to treat the effluent from the settling tank shall be submitted to this Department for approval.
6. That sufficient chlorine or hypochlorite, not less than 15 parts of available chlorine per million gallons of sewage treated, to properly treat the clarified effluent, shall be used.

7. That proper changes in the construction and operating arrangement of the settling tank in accordance with plans satisfactory to this Department shall be made to insure proper operation of the tank should it be found that the flow is not uniformly concentric or that the tank does not operate efficiently.

8. That whenever required by the State Commissioner of Health, satisfactory detailed plans for additional works for more complete treatment of the sewage than that provided for by the present plans shall be submitted for approval; and after the approval of said plans, any or all portions of such additional or supplementary works for more complete treatment of sewage shall be constructed and put in operation at such time or times thereafter as said Commissioner may designate.

Supplemental plans for separate sewer system extensions in Wagner and Atlantic avenues and Lovejoy street in the village of Sloan were submitted by the board of trustees through the village Engineer, Mr. George C. Diehl, on November 21, 1914.

Amended plans for a general system of sewerage and sewage disposal for the village of Sloan were approved by this Department on July 16, 1914, and comprise a separate system of sewers and a sewage disposal plant located on the bank of Little Buffalo creek, near the intersection of Wagner and Vanderbilt streets. The disposal plant, which it is proposed to construct, consists of a circular Imhoff tank, with circumferential flow and a sterilizing plant, the effluent to be discharged into Little Buffalo creek at least until the construction of certain trunk sewers in the city of Buffalo and the execution of an agreement between the village of Sloan and the city of Buffalo makes possible the discharge of the sewage from the village of Sloan into the Buffalo sewer system.

The proposed sewers are to be constructed in Wagner and Atlantic avenues and Lovejoy street, plans for sewers in the portions of these streets, which it is not intended to sewer, not being shown on the general plans approved on July 16 last. The sewers are to be constructed of 8-inch vitrified tile pipe and are to be laid on a gradient of 0.35 per cent. Manholes are to be placed at all changes of gradient and alignment and at intervals of not to exceed 300 feet. It appears that the proposed sewers if properly constructed should serve the purpose for which they are intended.

It is proposed to discharge the sewage to be collected by the proposed sewers into an existing 15-inch sewer in Lovejoy street in the city of Buffalo. No reference is made by the village authorities to any agreement made with the city of Buffalo for such discharge of sewage, but this is a matter for adjustment between the village and the city authorities.

In view of the above, I beg to recommend that the plans be approved and a permit issued to the board of trustees of the village of Sloan, allowing the discharge into Buffalo creek through the Buffalo sewer system of sewage to be collected by the proposed sewers, on condition that whenever required by the State Commissioner of Health, the village shall, by arrangement with the city of Buffalo, provide for proper treatment of such sewage before its discharge into Buffalo creek, or shall convey such sewage to and treat it in the sewage disposal plant of the village of Sloan.

ALBANY, N. Y., *November* 24, 1914

PERMIT

A permit, containing the following conditions, was issued in connection with the approval of the plans on November 24, 1914:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary.

2. That the issuance of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.

3. That only sanitary or domestic sewage and no storm water or surface water from streets, roofs or other areas shall be admitted to the proposed sewers.

4. That whenever required by the State Commissioner of Health, the village of Sloan shall provide for proper treatment of the sewage to be collected by the proposed sewers in accordance with plans satisfactory to this Department, either by arrangement with the city of Buffalo or by conveying such sewage to the disposal plant of the village of Sloan in a manner to be shown by plans satisfactory to this Department.

SONYEA (Craig Colony for Epileptics)

Plans providing for a modification and reconstruction of six of the sand filters, comprising a portion of the sewage disposal plant at the Craig Colony for Epileptics, were submitted for approval on July 16, 1914, and were approved on July 16, 1914.

The report on the examination of plans follows:

Plans for modification and reconstruction of six of the sand filters comprising a portion of the disposal plant at the Craig Colony for Epileptics at Sonyea, N. Y., were submitted to this Department for approval by the State Architect on July 15, 1914.

The old disposal plant at the institution consisted of a screen chamber and natural sand filters. Plans for alterations and additions to this sewage disposal plant were approved on August 16, 1910. These plans provided for the installation of a settling tank and dosing chamber and for the subdivision of the three sand filter areas into twelve intermittent sand filters, of which two were to be used for the disposal of sludge. These filters were formed by grading the natural soil composed largely of sand and gravel and laying underdrains at a depth of three and one-half feet below the surface of the ground.

The plans and specifications now submitted show that it is proposed to remove the filtering material from six of the existing sand filters, to grade the bottom of these filters, and to place a new underdrain system and new filtering material in these beds. The present filtering material from the beds is to be removed and the bottom of the filters graded to form ridges about twenty feet apart. In the shallow trenches between these ridges are to be placed lines of underdrains composed of 5-inch bell and spigot vitrified tile, which are to be connected with new main collecting drains composed of 6 and 8-inch vitrified tile laid with cement joints. The underdrains, which are to be laid with open joints, are to be surrounded with six inches of gravel or broken stone, ranging from three-quarter inch to one-sixteenth inch in size, with the coarser material next to the pipe.

Above the underdrain system is to be placed six inches of gravel or broken stone. The lower four inches of the gravel or broken stone is to be from two inches to one inch in size and the top, two inches, is to consist of material from one-quarter inch to one-sixteenth inch in size. Above these layers of coarse material is to be placed a filtering material composed of two and a half feet of clean sand, having an effective size of from 0.35 millimeters to 0.5 millimeters. The point of discharge of the effluent from the filters, which is into the Keshequa creek, a tributary of Canaseraga creek and the Genesee river, is not to be changed.

From our careful examination of the plans, it appears that the proposed modification of the sand filters, if properly carried out, should increase the efficiency of the disposal plant at the institution, and I would therefore recommend that the plans be approved.

ALBANY, N. Y., *July* 16, 1914

TONAWANDA

Plans for proposed sewers of the highland district of the city of Tonawanda were submitted for approval on June 8, 1914. These plans, after a careful examination of them, were returned for revision. Plans revised in accordance with the requirements of the Department were finally submitted on June 30, 1914, and were approved on July 8, 1914.

The reports on the examination of plans and the conditions of permit issued in connection with the approval of them follow:

Plans for proposed sanitary sewer extensions in the city of Tonawanda, Erie county, were submitted to this Department for approval on June 15, 1914.

A single set of these plans, providing for a compound sewer system, that is, sanitary, combined and storm water sewers in the so-called Highland district, covering an area of some 200 acres, were presented to this office by the corporation counsel and the city engineer on June 8, 1914. The plans were at once given a preliminary examination and the city officials were offered the following suggestions with reference to modifications in the design of the system:

> 1 That the discharge of sanitary sewage into the storm sewers on Highland avenue and Delaware avenue should be eliminated, on Highland avenue, by an additional sewer, and the one on Delaware avenue by using one of the two lines of storm sewers for sanitary sewage and the other for storm water.
>
> 2 That the shallow grades on John street be eliminated.
>
> 3 That all overflows into the State ditch from the sewers carrying sanitary sewage be eliminated.
>
> 4 That the pumping station be equipped with a second pump and gasolene engine.
>
> 5 That general plans showing the sewers into which sewage discharges at Minerva street be submitted.
>
> 6 That a report of the engineers accompany the plans.

Our examination of the plans now presented shows that they have been revised in general accordance with the above recommendations. The proposed sewers are to vary in size from 8 inches to 15 inches in diameter, and are for the most part to be provided with slopes sufficiently steep to give self-cleansing velocities. There are, however, certain modifications and corrections which should be made on the plans before they will be in satisfactory condition for acceptance.

In the first place, it is not clear from the plans that the entire sewer on the east side of Delaware avenue is to be used for sanitary sewage only. In fact, the plans would indicate that only the lower portion of this sewer is to be used for sanitary sewage and that the section south of Walter avenue is to receive both storm water and sanitary sewage, thereby converting this sewer into a combined sewer. The storm water should either be entirely eliminated from this sewer or an additional sewer, designed to carry sanitary sewage only, should be provided for Delaware Avenue and the proposed method of caring for the sanitary sewage in this street should be clearly shown by the plans in detail.

If it is proposed to use all of the existing storm-water sewer on the east side of Delaware avenue for sanitary sewage only, a profile of the entire sewer showing proposed slopes and grades should be submitted and the slope of that portion of the lower section of the sewer shown with a slope of .07 per cent. should be increased to not less than .15 per cent. which is the flattest slope on which a sewer of this size should be laid if self-cleansing velocities are to be obtained. It would appear from the plans that a steeper slope than .15 per cent. could be obtained for the entire sewer by reconstructing a portion of it. Such reconstruction, however, would probably necessitate a modification of the design of the sewer in Walter avenue.

The plans show that it is proposed to cross the State ditch at Delaware avenue and Main street by means of single tube inverted [illegible] siphon at Delaware avenue is planned with a single line of 12-inch cast-iron pipe about 125 feet long. The operating head of this siphon or the difference of elevation between the invert of the sewer at the manholes above and below the siphon is .37 feet. No operating head is provided for in the Main street siphon which is also planned with a single line of 12-inch cast-iron pipe.

It is evident, therefore, that the design of these siphons is not satisfactory inasmuch as with the comparatively small flow of sanitary sewage that would in all probability be tributary to the siphons for a considerable period after their installation, the velocity of flow through them would be low and the comparatively large 12-inch pipes comprising the siphons would act as small settling tanks and tend to produce rapid clogging. In order to insure a more satisfactory operation of the siphons than would be obtained with the proposed arrangement they should have operating heads of not less than one-half foot and each siphon should be composed of two pipes not more than eight inches in diameter. The pipes comprising the siphons should be provided with valves and should be so arranged as to permit of operating one line at a time and of cleaning the siphon in case of clogging. Detailed plans of the siphons, designed in accordance with the above suggestions, should be submitted.

The plans also provide for an 8-inch sewer on the west side of Highland avenue designed with slopes of .2 per cent. and .3 per cent. The slopes of sewers of this size should under ordinary conditions not be less than .35 per cent. in order to give self-cleansing velocities in them. Owing, however, to the comparatively short length of the proposed sewer and the close spacing of the manholes it might be permissible to allow a slope as low as .3 per cent.

There are also certain discrepancies in the plans which should be corrected. A 10-inch sewer on John street is shown with a .2 per cent. slope while detailed plans and profiles of this sewer show a slope of .3 per cent. On the plans the proposed sewer in King street is shown flowing down Queen street to Highland avenue and the detailed plans show this sewer tributary to the Wall street sewer. These discrepancies should be corrected.

Some of the proposed sewers, such as portions of the John street, Walter street and Fuller street sewers and the 15-inch cast-iron line between the pumping station and Main street are shown less than four feet below the street grades, and in one or two cases with coverings inadequate to sufficiently and properly protect the sewers. Defects of this class should not be permitted unless they are absolutely unavoidable or unless conditions are such that no objectionable results would follow from shallow grades. Grading up to streets would not remedy the conditions unless the lots are graded up as well as the streets or unless the ground on each side of the streets is higher than the streets, which does not appear to be the case judging from the topography. Sewers should be sufficiently low to protect the pipes and permit of making house connections with slopes of about one-eighth of an inch per foot. It would appear that inasmuch as it will be necessary to pump the sewage from this sewer district the sewers could all be laid sufficiently low to adequately protect them and permit of properly making house connections with them.

With the exception of the sewage collected by the Main street and Park avenue sewers the entire sanitary sewage of the district is to be conveyed by gravity flow to a pumping station located on the north side of the State ditch near the foot of Highland avenue extended, from which it is to be pumped against a head of about 15 feet into a 15-inch gravity line tributary to the 30-inch combined sewer in Minerva street which empties into the Niagara river at the foot of Bouck street extended. The sewage upon reaching the pumping station is to be discharged into a pump well, 7′x15′x12′ deep inside dimensions. An overflow is planned on one of the sewers entering this pump well. The pumping station located adjacent to the pump well and covered by a building is to be equipped with two 6-inch centrifugal pumps located in a dry well with the suctions extending through a wall into the adjacent pump well. The pumps are to be driven by automatically operated motors. An auxiliary gas engine is to be installed for the purpose of operating the pumps in the case of emergency or in the case of the failure of the supply of electric current.

It appears that the proposed pumping equipment should be adequate to satisfactorily handle the maximum rate of flow of sewage and inasmuch as both the pumps and the motive power are to be installed in duplicate, it should not be necessary to provide an emergency overflow for the sewer leading from Delaware avenue. Such overflow should be omitted.

In conclusion I would state that the plans as presented are not in satisfactory shape for approval, and that before they are finally accepted they should be modified in the following respects:

1. The proposed method of completely separating the sanitary sewage and storm water on Delaware avenue should be shown in detail by the plans.
2. If the existing storm water sewer on the east side of Delaware avenue is to be used for sanitary sewage, the slope of the flat portion of the lower section of this sewer should be increased to not less than .15 per cent.
3. The operating head of the siphons at Delaware avenue and Main street should be not less than .5 feet and the single lines of 12-inch pipe comprising the siphons should be replaced by double lines of pipes not larger than 8 inches in diameter.
4. The sewer on the west side of Highland avenue should be provided with a slope of not less than .3 per cent. and preferably not less than .35 per cent.
5. All shallow sewers should be lowered sufficiently to protect them and permit of making house connections.
6. The emergency overflow at the pumping station of the sewer leading from Delaware avenue should be omitted.
7. The discrepancies of the plans with reference to the sewers in John and Queen streets should be corrected.

I would, therefore, recommend that the plans be returned for modification, in accordance with the above requirements.

Albany, N. Y., June 17, 1914

The plans were accordingly returned for modification on June 18, 1914.

Revised plans of proposed sewers in the Highland district in the city of Tonawanda, Erie county, were submitted to this Department for approval on July 2, 1914. Application for the approval of the plans signed by the chairman of the board of public works was received June 30, 1914.

The plans now submitted and under consideration have been revised in accordance with all of the above recommendations and show that the sewer on the easterly side of Delaware avenue is to be used for a sanitary sewer only, and the sewer on the westerly side of this street is to be used for storm water; the slope of the flat portion of the sewer in Delaware avenue has been increased from .07 to .34; the slope of the sewer on the west side of Highland avenue has been increased from .2 per cent. to .3 per cent.; the emergency overflow at the pumping station has been omitted, and the discrepancy on the plans with reference to the sewers in John and Queen streets has been corrected. It is also stated by the designing engineers that wherever possible and where street grades are not to be raised, all shallow sewers have been lowered in order to protect them and permit of making house connections.

Although the operating head on the Delaware avenue siphon has been increased to .5 of a foot and the head on the Main street siphon to one foot, and double lines of 8-inch cast-iron pipe substituted for the single lines of 12-inch pipe at these siphons, the design as shown by the detailed plans does not appear to be satisfactory. The plans provide for a valve chamber and a manhole divided into two compartments at the upper ends of the siphon and a similar double manhole and discharge manhole at the lower end of the siphon. According to the plans the sewage will be discharged into the valve chamber through a 10-inch pipe and will then flow into either of the two compartments of the manhole at the upper ends of the siphon through two 10-inch pipes provided with valves. The outlets on the lower ends of the siphon are not provided with valves so that under the proposed arrangement it will not be practicable to shut off the flow through one line of the siphons or to empty one line during cleaning while the other line is in operation.

The manholes on each end of the siphons are to be connected with 8-inch cast-iron pipe extending from the invert of each manhole. Under this arrangement the manholes will be practically full of sewage and will act as settling tanks which will probably result in the silting up of the manholes and completely clogging up the siphons. A condition of nuisance would also in all probability be created by the putrefaction of the sludge which would collect at the bottom of the manhole. It appears that this condition could be remedied by having the sewage from the valve chamber discharge into a comparatively shallow receiving basin, say 12 to 18 inches in depth, located near the top of each of the manholes and having the siphon extend vertically from the low point of each of these shallow basins, to the bottom of the manholes ending in a tee provided with a valve to facilitate cleaning of the siphon in case of stoppage. The arrangement of the manhole at the lower end of the siphon should be similar to that of the upper end.

I am of the opinion that a flush tank should be substituted for the manhole at the upper end of the 12-inch sewer in Walter avenue owing to the comparatively small amount of sewage that will be tributary to this sewer and the consequent low depth of flow in the sewer. With the changes recommended, I believe that the proposed sewers if properly constructed should satisfactorily care for the sanitary sewage of the Highland district.

With respect to the future disposal of the sewage of the city of Tonawanda, it may be stated that this question was discussed in my report on the examination of the plans for proposed changes in the sewer system in the so-called Gastown district under date of May 17, 1909. It was pointed out at that time that the volume of flow of the Niagara river was so large and affords favorable opportunity for dilution and dispersion that no general nuisance would probably be created at or below Tonawanda at that time.

It appears, therefore, that although the need for treatment of the sewage of the city of Tonawanda is not urgent at the present time certain conditions may arise in the future that will necessitate the treatment of the sewage, especially in connection with any general requirements which may be made at a later date to afford greater protection against the pollution of the river relative to its use as a source of public water supply for the several cities along its banks.

I would, therefore, recommend that the plans be approved and a permit issued allowing the discharge of sewage from the proposed sewers into the Niagara river at the foot of Bouck street extended, and that the permit contain in addition to the usual revocation and modification clauses the following conditions:

1. That whenever required by the State Commissioner of Health satisfactory detailed plans for the treatment of the entire sanitary sewage of the city shall be submitted to this Department for approval and that after the approval of such plans any or all portions of the treatment works shall be constructed and put in operation.
2. That before the construction of the inverted siphons in Main street and Delaware avenue detailed plans of these siphons designed in general accordance with the recommendations of this report, or some other satisfactory method, be submitted for approval.

ALBANY, N. Y., *July* 7, 1914

PERMIT

A permit containing the following conditions was issued in connection with the approval of the plans on July 8, 1914:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary.
2. That the issuance of this permit shall not be deemed to affect in any way action by this department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.
3. That only sanitary or domestic sewage, and no storm water or surface water from streets, roofs or other areas shall be admitted to the proposed sewers.
4. That whenever required by the State Commissioner of Health satisfactory detailed plans for the treatment of the entire sanitary sewage of the city shall be submitted to this Department for approval and that after the approval of such plans any or all portions of the treatment works shall be constructed and put in operation, when required by the State Commissioner of Health.
5. That before the construction of the inverted siphons on Main street and Delaware avenue, detailed plans of these siphons designed in general accordance with the recommendations of the report of the chief engineer transmitted this day to the city authorities, or in accordance with some other satisfactory method, shall be submitted for approval and the siphons thereafter be constructed in accordance with such detailed plans approved by this Department.

UNADILLA

Plans for a proposed sewer extension in Martin Brook street in the village of Unadilla, were approved on July 29, 1914. The report on the examination of plans and the conditions of the permit issued to the village follow.

Plans for a proposed sewer extension in the village of Unadilla, Otsego county, were submitted to this Department for approval on July 17, 1914. Application for the approval of the plans, signed by the village President, one of the members of the Board of Trustees and the Health Officer, under date of June 5, was received on June 8.

The village of Unadilla is situated in the southern part of Otsego county on the Susquehanna river about 5 miles above Sidney and some 17 miles below Oneonta. It is provided with an unfiltered water supply derived from springs, driven wells and Martin Brook, and the water works are controlled by the Unadilla Water Works. The village is not provided with a public sewer system and the sewage appears to be cared for by means of privies, cesspools and private or semi-private sewers discharging into the Susquehanna river. The population of the village according to the 1910 census is about 1,000.

The matter of the proposed sewer construction in Martin Brook street has been before the Department for a considerable time and has been the subject of much correspondence and several conferences between this office and representatives of the village. On June 15, 1912, a single copy of a profile of the proposed sewer in Martin Brook street together with an application for the approval of the plans was received from the village President, a general plan of the village showing present and proposed sewers having been left by him in this office on May 29, 1912, at which time the requirements of this Department with reference to the preparation and submission of plans were outlined. It was not until July 17, 1914, however, that satisfactory plans were submitted in duplicate.

The general plan submitted in 1912 shows that there are a number of sewers in the village, most of which have been constructed through private property and which discharge into the Susquehanna river through some 8 different outlets. Some of them apparently receive both sanitary sewage and storm water.

It appears that one of these sewers, a 24-inch sewer about 700 feet long, was constructed some 14 years ago in Martin Brook street, from a point about 100 feet north of Main street to a point near a swampy area some 200 feet from the Susquehanna river for the purpose of caring for the overflow of Martin Brook which runs parallel to this sewer. The 24-inch sewer, however, was found to be inadequate as to capacity to properly care for the overflow from the brook and the stream was consequently walled up about 2 years after the construction of the sewer. The creek has not overflown since that time and the sewer, at present, cares for only two catch basins at Main street.

According to the letter transmitting the present plans and signed by the village president and one of the members of the Board of Trustees, the proposed sewer in Martin Brook street is to be constructed for the purpose of relieving the insanitary conditions caused by the overflowing of cesspools in this section of the village.

The plans show that it is proposed to care for the sewage in this section by extending the existing 24-inch sewer in Martin Brook street northerly for a distance of about 1,500 feet. The lower half of the proposed extension is to be a 12-inch sewer with a slope of 0.5% and the upper section is to consist of an 8-inch sewer laid on a slope of 1.6%. The existing sewer is also to be extended to the river by means of a 12-inch sewer which is to have a slope of 2.27%. A flush tank is to be installed at the upper end of the proposed sewer.

According to a letter from the village authorities referred to above, the upper 8-inch section of the sewer is to receive the sewage from eight residences and the 12-inch portion of the sewer is to receive the sewage from 14 additional residences. It is also stated that the proposed sewer is to receive the wastes from a creamery and the surface water from a catch basin at the upper end of the 12-inch sewer near the Delaware & Hudson Railroad right of way.

From our examination of the plans, it is found that the design of the proposed sewer is satisfactory as far as self-cleansing velocities and facilities for cleaning and inspection of the sewer are concerned. No surface or storm water from roofs, streets or other area should, however, be permitted to enter the sewer in view of the probable necessity for the future treatment of the sewage of the village and the sewer should, therefore, be constructed on the separate plan. With the storm water eliminated, it would in all probability be possible to reduce the size of the 12-inch portion of the sewer above the existing 24-inch sewer to 10 or possibly 8 inches in diameter and still have ample capacity for sanitary sewage.

With respect to the treatment or disposal of the sewage of the village, it may be stated that it has been the consistent policy of the Department to restrict or remove as far as possible the pollution of the waters of the State from untreated sewage and to require in the case of permits issued for sewer construction that consideration should be given to the future disposal of sewage. In the case of Oneonta just above Unadilla, plans for the interception and disposal of the entire sanitary sewage of that city were approved on December 2, 1912. The permit issued to the Sewer Commissioners of the village of Sidney on November 14, 1913, in connection with the approval of plans for a proposed sewer extension in the village required that detailed plans for the interception and treatment of the entire sanitary sewage of the village shall be submitted to this Department for approval on or before January 1, 1915.

I am of the opinion that the village of Unadilla should take steps at an early date to provide for the collection and disposal of its sewage, not only for its own protection but also for the protection of municipalities located on the river below. The village should employ the services of a competent sanitary engineer to make a study of its sewerage problem and prepare plans for a comprehensive sewerage and sewage disposal system, such plans to be submitted to this Department for approval.

Any plans prepared should be designed on the separate plan and should cover all developed portions of the village, as required by the Village Law, and an effort should be made to incorporate all of the existing and proposed sewers. The village may then construct the whole of such system or may construct any portion thereof, as may be necessary subject to the approval of this Department.

Such comprehensive plan if followed out would insure that all future sewer construction would be carried out along permanent and economic lines and would be much cheaper in the long run than the construction and maintenance of individual sewage disposal plants which as a rule are unsatisfactory and impracticable especially in closely built up communities provided with public water supplies where there is usually little opportunity for the proper disposal of sewage on individual lots without the creation of nuisances.

In view of the above, I would recommend that the plans now before the Department be approved and a permit issued allowing the discharge of sewage from the proposed sewer into the Susquehanna river at the foot of Martin Brook street extended on condition that on or before October 1, 1915, satisfactory detailed plans for a comprehensive sanitary sewer system and for the preliminary treatment of the sewage by clarification or sedimentation together with general plans for supplementary or more complete treatment should such supplementary or more complete treatment of the sewage be required in the future, be submitted to this Department for approval.

ALBANY, N. Y., *July* 22, 1914

PERMIT

A permit, containing the following conditions, was issued in connection with the approval of the plans on July 28, 1914:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary.
2. That the issuance of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.
3. That only sanitary or domestic sewage and no storm water or surface water from streets, roofs, grounds or other areas shall be admitted to the proposed sewer extension.
4. That on or before October 1, 1915, the village authorities shall submit to this Department for approval satisfactory detailed plans for a comprehensive sanitary sewer system for the village and for the sedimentation of the entire sanitary sewage of the village together with general plans for more complete treatment of the sewage.
5. That whenever required by the State Commissioner of Health the works for said sedimentation or for the more complete treatment of the sewage shall be constructed and put in operation in accordance with detailed plans approved by this Department.

WALDEN

Plans for sewerage and sewage disposal for the the village of Walden were submitted for approval on October 1, 1914, and, after careful examination of them, they were returned for modifications on October 20, inasmuch as they were not in satisfactory condition for approval. Plans revised in accordance with the requirements of this Department were resubmitted for approval on November 9, 1914, and were approved on November 16, 1914. In response to an application from the board of trustees of the village, a permit was granted on November 16, 1914, allowing the temporary omission from construction all that portion of the general system of sewers and sewage disposal of the village known as the Wallkill river watershed system.

The reports on the examination of the plans and the conditions of the permits issued in connection with their approval follow.

Plans for a separate system of sewerage and sewage disposal works for the village of Walden, Orange county, were submitted to this Department for approval by the board of trustees on October 1, 1914.

The records of this Department show that no plans for sewers have ever been submitted to this Department for approval. A petition was submitted to the Department by the board of trustees on July 18, 1904, which cited the fact that numerous private and public sewers and drains discharged into Tin brook and the Wallkill river within the village limits, and in which petition application was made for the issuance of a permit for the discharge of sewage from such sewers and drains in accordance with the provisions of Chapter 468 of the Laws of 1903. The village authorities were at that time advised that when plans showing existing and proposed sewers and including plans for sewage disposal were submitted for approval the matter would be given consideration.

The plans now submitted were prepared by H. W. Taylor, consulting engineer, of Albany, and C. H. Smith, civil engineer, of Walden. They comprise the following tracings:

1. General plan of sewerage system.
2. Two sheets of details of sewage disposal plant.
3. Five sheets of profiles of sewers.

The report of the engineer states that the village of Walden is divided into two drainage areas, one tributary to the Wallkill river and the other tributary to Tin brook, a branch of the Wallkill, and that, after a study of several methods of conveying the sewage to a disposal plant, it was determined to build two disposal plants, one to treat the sewage from the population of about 1,250 people on the Tin brook watershed, the other to treat the sewage from the 3,750 people on the Wallkill river drainage area, instead of conveying all the sewage to one plant. It is proposed to use the sewers which are at present built in the village in such instances as these sewers have no storm water connections and are used for sanitary sewage only.

The village of Walden is situated in the northern part of Orange county on the Wallkill river and Tin brook. It is provided with an unfiltered water supply taken from wells and the works are controlled by the municipality. The village is provided with combined sewers discharging into both the Wallkill river and Tin brook. The present population of the village, according to the engineer's report, is approximately 5,000, and its area is about 1,000 acres, giving a density of about 5 per acre. The growth of the population of the village has been moderate, showing a gradual increase of about 3 per cent. a year since 1900. The designing engineer estimates that the population ultimately to contribute sewage from the entire village will be approximately 10,000.

The plans provide for two outfalls, which will discharge at the following points:

1. The outfall sewer from the disposal plant to treat the sewage from the Wallkill river drainage area is to discharge into the Wallkill river about 800 feet north of the northerly corporation boundary.
2. The outfall sewers from the disposal plant to treat the sewage from the Tin brook drainage area will discharge into Tin brook about 800 feet north of the northerly boundary.

The population which will in the immediate future contribute sewage to each outlet with corresponding assumed flow in gallons per day based on 100 and 300 gallons per capita respectively will be as follows:

1. Population 3,750 flow at 100, 375,000 flow at 300 — 1,125,000.
2. Population 1,250 flow at 100, 125,000 flow at 300 — 375,000.

The population which will ultimately contribute sewage to each of these outlets with a corresponding assumed flow in gallons per day based on 100 and 300 gallons per capita per day respectively will be as follows:

1. Population 7,500 flow at 100, 750,000 flow at 300 — 2,250,000.
2. Population 2,500 flow at 100, 250,000 flow at 300 — 750,000.

The plans have been carefully examined with respect to the sewerage system and sewage disposal works. In connection with the sewerage system the design has been carefully studied with reference to alignment, sizes, grades, capacities, facilities for cleaning and inspection and flushing and other features of a hydraulic or sanitary nature. In connection with means for sewage disposal it has been studied with reference to general method and efficiency of the sewage disposal plant as a whole, and of the capacities and practical operation of the individual structures, appurtenances and apparatus.

The sewers, which range in size from 8 to 18 inches, have gradients sufficiently steep to give self-cleansing velocities and are of sufficient size to give capacities adequate to care for the probable future population which will contribute sewage to them. There are, however, certain omissions which should be supplied. In Maple street is shown an 8-inch sewer extending westerly to a manhole at the corner of Pine street and an 8-inch sewer in Pine street connects with this, but there is no outlet from the manhole at the corner of Pine and Maple streets. This apparently is an omission which should be corrected.

The sewers in a number of streets, such as South Montgomery and Orange streets, are not shown extending to the corporation line, and a number of streets such as those crossing Elm and Union streets in the northern part of the village are not provided with sewers. Although the village may not desire to construct sewers in these streets at present, they should, nevertheless, be shown by the plans in order to comply with the Village Law, which requires that the plans "shall be comprehensive and shall cover all portions of the village."

Since the public water supply of the village of Walden is partially derived from wells located near the Lehigh Valley R. R. tracks at Pump street, it is important that the sewers in this location should be so located and constructed that the water derived from these wells shall not be infected by sewage. The records of the Department show that in December, 1913, an investigation was made by a representative of this Department of a typhoid epidemic in the village of Walden, and it appeared that this epidemic resulted from the pollution of the public water supply by sewage which, due to the clogging and overflowing of sewers, reached the vicinity of the wells from which the supply is obtained. An 8-inch sewer is shown on the plans passing directly across the area in which the pumps are located between Pump and Scofield streets. Even if this sewer should be constructed of cast-iron pipe with tight joints, it would be a continual source of danger to the health of the village.

If the village intends to continue using the wells near Pump street as a source of water supply, this sewer should be omitted and the sewage tributary to it carried across the railroad to the proposed sewer in the street parallel to Elm street. As an additional safeguard for the water supply the sewers in Scofield street between Harrison street and Orange avenue and the sewer in Orange avenue between Scofield and Pump streets should be constructed of cast-iron pipe with leaded joints. The sewer in Pump street should also be moved to a line back of the houses between Pump and Grant streets and constructed of cast-iron pipe.

All the proposed sewers have been designed with straight alignments between manholes, and manholes have been provided at every change of grade. Flush tanks have been placed at the upper ends of nearly every lateral. In the one instance where a flush tank is not placed at the upper end of a lateral, namely, in Albany avenue, a flush tank will probably not be necessary, due to the short length of sewer and the close spacing of manholes.

The spacing between manholes is not excessive, the maximum spacing being about 575 feet.

It appears from the report of the designing engineer and from the application from the board of trustees that the village intends at present to build the Tin brook trunk line, Imhoff tanks, filter beds, etc., together with laterals on Hepper, John, Main, Ulster, Richardson, James, Woodruff, Williams, Orchards and Lincoln streets, all of which are tributary to the Tin brook disposal plant.

The report of the designing engineer states that the sewage from the lower end of Riverview, Rifton and Maple streets is to be pumped through a force main passing up Pine street. The exact location of this pumping station is not shown on the plans, nor are any details of the station indicated on the plans. The location of the pumping station should be shown by these plans and details of the same should be submitted for approval before this portion of the sewer system is constructed.

It is proposed to treat the sewage collected by this system in two sewage disposal plants. The sewage disposal plant to treat the sewage from the Wallkill river drainage area is to be located on the eastern bank of the Wallkill river about 800 feet north of the northerly boundary line of the village, while the sewage disposal plant to treat the sewage from the Tin brook drainage area is to be located on the western bank of Tin brook about 700 feet north of the northerly boundary line of the village.

The Wallkill river has a drainage area above the disposal plant of approximately 477 square miles and the drainage area of Tin brook above the disposal plant is approximately 21 square miles.

The Wallkill river above the disposal plant is not used directly for water supply purposes in this State, although several small water supplies are taken from the tributaries. Below this disposal plant the stream is not used for water supply purposes by any municipality.

The sewage disposal plant to treat the sewage from the Wallkill river drainage area is apparently to be located at a considerable distance from any built-up section. The sewage disposal plant for the Tin brook drainage area is to be located about 800 feet from the nearest street shown on the general plan, and while an extension of this street would pass much closer to the disposal plant, it is not probable that it will be so extended, because of the location of the railroad. In the case of the Wallkill river disposal plant there is a fall of 6.50 feet from the water surface of the Imhoff tank to the water surface elevation given in the river, and in the Tin brook disposal plant there is a fall of 12.60 feet from the water surface of the primary Imhoff tank to the water surface elevation given for Tin brook. The bottom of the sprinkling filter and the flow line of the final settling tank, however, are only 1.75 and 1 foot respectively above the water level of the brook, as shown by the plans. Flood heights of the streams are not shown, however, so that it is impossible to determine to what extent the operation of the plant would be interfered with by reason of high water in the river and brook.

The design provides that the sewage from the Wallkill river drainage area is to be treated in a twin settling tank of the Imhoff type without further treatment. These tanks, which are to be built of concrete with a total depth of 26 feet, are so arranged that the sewage may be allowed to enter the tanks from either end, thus providing for a reversal of the flow through the tanks. The settling compartments of the tanks have a total capacity below the flow line of about 117,800 gallons, which for a present population of 3,750 and a water consumption of 100 gallons per capita per day, gives a period of detention of the sewage in the tank of about 7.5 hours when both tanks are in operation and of about 3.7 hours when only one tank is in operation. For a future population of 7,500 and the same assumptions regarding water consumption a period of detention of the sewage in the tank of about 3.7 hours for both tanks is obtained. The solids which settle out of the sewage will pass through slots in the bottoms of the settling compartments into the sludge chambers which have a total capacity of about 12,264 cubic feet.

This capacity is sufficient to provide a period of detention of the sludge in the chamber of about 20.7 months for the present population of 3,750 for both tanks and 10 months for one tank. For the future population of 7,500 the period of detention of the sludge in the sludge chamber is 10 months for both tanks. After treatment in the Imhoff tanks the sewage is to flow through about 200 feet of 14-inch cast iron pipe into the Wallkill river.

Although it is probable that the clarified sewage from this district could at present be discharged into the Wallkill river without objection, general plans for supplementary or more complete treatment of the sewage should nevertheless be submitted.

The sewage from the district tributary to Tin brook is to be treated in a sewage disposal works to consist of preliminary settling tanks of the Imhoff type, dosing tank, sprinkling filter and final settling tanks also of the Imhoff type. Upon reaching this disposal plant the sewage enters the inlet channel of the preliminary settling tanks which are so arranged that the sewage may be allowed to enter them from either end. The settling compartments of the preliminary settling tanks have a total capacity below the flow line of about 35,600 gallons, which for the present population of 1,250 and a per capita water consumption of 100 gallons per day gives a period of detention of the sewage in the tank of about 6.8 hours. For an estimated future population of 2,500 and the same assumption regarding water consumption the settling compartment will give a period of detention of the sewage in the tank of about 3.4 hours. The sludge compartments of these tanks have a total capacity of about 3,320 cubic feet, which for a present population of 1,250 gives a period of detention of the sludge in the tank of about 16 months.

The effluent from the preliminary settling tank is to flow into a dosing chamber which is to be built of concrete as a separate structure adjacent to the sprinkling filter bed. A siphon of the Miller type is placed in the dosing chamber which has a capacity below the maximum water surface of about 900 gallons. This capacity will cause the siphon to discharge at about 10 minute intervals for the present rate of sewage contribution and at about 5 minute intervals for the estimated future daily sewage contribution.

The dosing chamber discharges the sewage into the distributing system of the sprinkling filter. This filter is to be constructed with concrete walls and is to be filled to an average depth of about 6 feet with crushed stone from one to two inches in size. A system of 8-inch and 6-inch cast iron pipes divided into two sections is to distribute the sewage to the nozzles which are spaced 10 feet apart. The distribution pipes are apparently to be laid on the top of the bed just under the surface of the stone and the plans do not show that the distribution system is to be supported in any way except by the filter material.

I am of the opinion that the distributing pipes should be supported on piers in order to prevent the joints of the pipe from opening up in case of unequal settlement in the filtering material. The distributing system should also be laid at a sufficient depth below the surface of the filter to prevent freezing during extremely cold weather.

The sprinkling filter has a total area of about 0.155 acres which for the present population will give a rate of application of the sewage to the bed of about 806,000 gallons per acre per day while for the estimated future population the rate of application will be about 1.612,000 gallons per acre per day. A system of underdrains consisting of half tile pipes laid on the concrete floor of the sprinkling filter 11 inches center to center collects the sewage after its passage through the filtering material and discharges it into a main channel built as part of the concrete floor. The manner of covering the main channel is not shown on the plans.

The difference in elevation between the surface of the sprinkling filter and the maximum water surface in the dosing tank is 4.5 feet. This head is too low to insure a uniform distribution of the sewage over the surface of the filter even with the comparatively close spacing of the nozzles proposed. I do not believe that the maximum static head on the nozzles spaced

10 feet center to center should be less than 5.5 feet. It appears that considerable head could be gained by increasing the size of the outfall sewe from 12 inches to 15 inches and decreasing the slope to correspond to th larger size sewer.

The effluent of the sprinkling filters discharges into final settling tanks o the Imhoff type. The settling compartments of these tanks have a tota capacity of about 14,850 gallons, which for the present population of 1,25 and the usual assumptions regarding the per capita daily water consumptio gives a period of detention of the sewage in the tank of about 2.8 hour while, for the future population of 2,500 and the same assumptions regardin the water consumption, a period of detention of the sewage in the tan of about 1.4 hours will be obtained. The sludge compartment of the fina settling tank has a total volume of about 255 cubic feet. The walls of th final settling tank are continued 4 feet above the flow line of the sewage i the tank in order that the elevation of the sewage in the tank may b raised either by means of the village water or by pumping water from th brook in order that sufficient head may be obtained to allow the sludge t flow by gravity onto the sludge bed. The shear gates on the inlet pipe wi prevent the sewage from backing up into the sprinkling filter. The effluen from the final settling tank is to discharge into Tin brook without furth treatment.

The sludge from the Wallkill river Imhoff tank is to be disposed of on sludge bed to consist of about 9 inches of gravel to be covered by about inches of sand. The bed is to be underdrained by 6-inch underdrains whi discharge into the main outfall sewer of the disposal plant. This sludge b is to have an area of about 1,600 square feet which for a present populati of 3,750 will be about 426 square feet of area per 1,000 population while the future population of 7,500 the same area will be provided since two be are shown on the plans. The sludge bed to receive the sludge from the Imh tanks of the Tin brook plant is to be constructed exactly similar to the Wallkill sludge beds with the exception that its area is to be less. An area about 625 square feet will be provided which for the present population 1,250 will provide about 500 square feet per 1,000 population while for future population of 2,500 about 250 square feet per 1,000 will be provid

In conclusion I would state that it appears from our examination of th plans that although the proposed sewerage and sewage disposal systems hav in general, been designed to meet the local requirements for sewerage and sewage disposal for the village, the sewage disposal plants are somewhat ove designed as to capacity and there are certain modifications which should b made in the plans before they are in condition for acceptance.

Although the sewer systems for comparatively small municipalities ar usually designed to care for the probable ultimate population to be serve by them within the life of the systems and although it is well to make certain provisions in the design of sewage disposal works for the probabl future population it would not be economical to construct disposal plan to care for more than a comparatively small increase in the population the communities over that existing at the time of the installation of th works unless conditions indicated that the community would have an unusually rapid growth.

In view of the above I would recommend that the plans be returned fo additions and modifications in the following respects:

1. The plans should show sewers in all streets and all portions streets indicated on the plans within the corporation.
2. The location of the pumping station to care for the sewage fr Riverview, Rifton and Maple streets should be shown by the plans.
3. The proposed sewer across private property between Scofiel Pump streets should be omitted and water supply of the village protected from pollution from sewage as suggested in the body report.
4. The plans should show general plans for more complete treat of the sewage in the Wallkill river sewer district.

The elevation of the mean high and maximum high water stages of the Wallkill river and Tin brook are shown on the plans. These elevations of Tin brook show that although the mean high water mark is from one foot to one and three-quarters feet below the flow line of the final settling tank and the bottom of the sprinkling filter, respectively, the maximum high water mark is from ¾ to 1¼ feet above these levels so that the operation of the sprinkling filter and final settling tank will be interfered with somewhat during floods. The report of the engineers states that the maximum high water conditions in Tin brook have a duration of from three to four days and that during these flood conditions it is proposed to by-pass the sprinkling filter and discharge the settled effluent from the Imhoff tank directly into Tin brook. I am of the opinion that owing to the greater degree of dilution in the stream at times of high water than during low flow no objectionable conditions will be created in the stream by the discharge of partially treated sewage into it at such times.

Although the plans do not show any modifications in the distributing system of the sprinkling filters, it appears from notes on the plans and from the report of the engineers that this system is to consist of cast iron pipe with universal joints, that the center lines of the distributing pipes are to be 1.3 feet below the top of the beds and that short risers consisting of 2½ inch nipples with couplings on the top to receive the thread of the nozzle heads are to be installed. These nipples are to be 12 inches long and will bring the crown of the nozzles one inch above the level of the stone in the filter. The construction of the distributing system of pipes with universal joints will obviate the necessity of supporting the distributing system on piers as any uneven settlement in the filtering material of the sprinkling filter should not affect the tightness of the joints as would be the case with cast iron pipe with leaded joints.

The maximum head of the sprinkling filter nozzles has been increased from 4½ to 5¾ feet. This increase of head has been obtained by increasing the size of the 12-inch outfall sewer 15 inches in diameter and decreasing the slope of this sewer from .25 per cent. to .2 per cent. The plans also show that it is proposed to cover the main collecting channel of the sprinkling filter by extending the 5-inch half tile underdrains across the collecting channel and laying the 3-inch half tiles with the bells removed, across the channel between a 5-inch underdrain to prevent stones from dropping into the channel. It is stated in the report that these 3-inch half tile drains will be cemented in place and thus held rigidly in position.

With respect to the sizes of the disposal plants which provide for twice the present population of the village, the report of the designing engineers states that it is considered cheaper in the case of small tanks to install both units in the original installation and that in the present design these tanks are so closely connected as far as reinforcements, etc., are concerned that the additional cost of installing two tanks in the original installation is not out of proportion to the advantage gained in construction. With reference to the sprinkling filter it is stated that it has been designed so as to permit of the construction of only one-half of the filter at first if desired by the village. The question of relative costs and advantages of constructing one or two tanks and the desirability of providing for a population that will probably not obtain for a considerable period in the future, is one that should be finally settled by the village authorities and their engineer.

As noted in my former report application is made by the board of trustees for permission to construct only the sewers and sewage disposal plant on the Tin brook watershed and to omit the construction of the proposed sewers and disposal plant in the Wallkill watershed on the grounds that the dilution of the Wallkill is adequate to care for the sewage which at present empties into this river through existing sewers. It is stated by the designing engineers that a nuisance is created by the discharge of sewage from existing sewers into Tin brook.

While the village authorities do not plan, at present, to construct the proposed sewers and sewage disposal works in the Wallkill river district and the question of treating sewage from this district may therefore be held in abeyance for the present, no new sewers in this district as shown by the plans may, under the conditions under which the plans are approved and under the specific provision of the Public Health Law and the village law, be constructed without constructing the sewage disposal plant for this district. Formal application should be submitted to this Department by the village authorities under and in accordance with the provisions of section 260 of the Village Law for the approval of the proposition to omit the portions of the permanent general system of sewers and sewage disposal referred to above.

In conclusion I would state that it appears from our examination of the plans that they have been revised in accordance with all the requirements of this Department and if properly constructed the sewer system and sewage disposal plants should satisfactorily care for the sanitary sewage of the village. I would therefore recommend that the plans be approved and a permit issued allowing the discharge of sewage from the proposed sewage disposal plants into the Wallkill river and Tin brook on condition that detailed plans for the proposed sewers shown by dot and dash lines shall be submitted for the approval of these plans on November 16, 1914:

ALBANY, N. Y., *November* 11, 1914

PERMIT

A permit containing the following conditions was issued in connection with the approval of these plans on November 16, 1914:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary.
2. That the issuance of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.
3. That both the sewer system and the sewage disposal works shown by plans approved this day shall be fully constructed in complete conformity with such plans or approved amendments thereof.
4. That only sanitary or domestic sewage and no storm water or surface water from streets, roofs or other areas shall be admitted to the proposed sewers or sewage disposal works.
5. That no sewage sludge from any part of the disposal works shall be discharged into the Wallkill river or any other watercourse.
6. That detailed plans for the proposed sewers shown by dot and dash lines on the general plan approved this day shall be submitted for approval before the construction of these sewers is commenced.
7. That whenever required by the State Commissioner of Health, satisfactory detailed plans for additional works for more complete treatment of the sewage of the village of Walden shall be submitted for approval; and upon approval of said plans any or all portions of such additional or supplementary works for more complete treatment of sewage shall be constructed and put in operation at such time or times thereafter as said Commissioner may designate.

WAPPINGERS FALLS

Plans for a sanitary sewer system and sewage disposal plant, consisting of an Imhoff tank and sludge drying bed, were submitted for approval by the village on March 12, 1914. These plans were not in satisfactory condition for final acceptance and were, therefore, returned to the designing engineer on May 4, 1914. Plans revised in general accordance with the recommendations of this Department, but providing for the substitution of a fine screen of the

Riensch-Wurl type for the Imhoff tank and for the treatment of the effluent from the screen by liquid chlorine, were resubmitted for approval on September 9, 1914. These plans were again examined and returned for revision on September 25, 1914. Plans revised in accordance with the requirements of this Department were finally submitted for approval on October 9, 1914, and were approved on October 20, 1914.

The reports on the examination of plans and the conditions of the permit issued in connection with the approval of them follow.

Plans for a separate system of sewerage and sewage disposal works for the village of Wappingers Falls, Dutchess county, covering the whole of the village, were submitted by the board of trustees on March 12, 1914.

The records of the Department show that on January 14, 1913, an inspection of the sewerage conditions in the village of Wappingers Falls was made by a representative of this Department at the request of the village board of health. The village authorities were urged at that time to have plans prepared for a modern system of sewerage.

After a preliminary examination of the plans now before us, it was found that no information had been supplied regarding the quantity and nature of the wastes from the Garner Print Works and Bleaching Company's plant and other manufacturing plants in the village, or in regard to the flow and the effect of tides in the stream into which the effluent from the disposal plant is to be discharged.

A letter was, therefore, addressed under date of April 3, 1914, to the designing engineer requesting the above information. In a letter subsequently received by the Department, the designing engineer states that the Garner Print Works and Bleaching Company is the only plant in the village producing waste matter other than sanitary sewage. This company has already installed a sewerage system and intends constructing a treatment works to care for sewage and wastes from its plant. This system will be entirely separate from the village system because the surface of the ground occupied by their plant is at a lower elevation than any part of the new system and therefore, if the Garner system were connected with the village system, it would necessitate reconstruction of the former and include a pumping plant.

The letter of the designing engineer also states that Wappingers creek is affected by the tide to a point within the village and is navigable up to the same point. The branch into which the effluent from the disposal plant is to discharge has a considerable flow during the wet season, and at other times a flow sufficient, in the opinion of the designing engineer, to prevent nuisance.

The plans now submitted were prepared by H. L. Sterling, civil engineer of Newburgh, and comprise tracings and blue prints of the following sheets:

1. General maps of village showing proposed sewer system.
2. Sheets showing details of disposal plant and sewer appurtenances.
3. One sheet showing profiles of sewers.

The report of the engineer states that the village of Wappingers Falls is not provided with a public water supply, although water for fire purposes has been made available in a few streets by a private corporation. Plans for a public water supply, however, have been prepared and are to be submitted to the State Conservation Commission for approval. It is the intention of the village authorities to install the water supply and sewerage systems at the same time.

No accurate data is, therefore, available regarding the per capita water consumption per day in the village. The engineer assumes 100 gallons per capita per day and a future population of 10,000. He states that, although the population, as shown by the census returns, has decreased in the past, that due to the opening of factories in the village, it has since been gaining.

The village of Wappingers Falls is situated in the southwestern part of Dutchess county, on Wappingers creek. The present population of the village, according to the engineer's estimate, is approximately 3,900, and its area is 594 acres, giving a density of about 6.6 per acre. The population of the village in the past has decreased about 523 in twenty years, but, using a density of 10 per acre, it is estimated that the population ultimately, to contribute sewage from the sewer district should the village become well built up, will be approximately 6,000.

The sewers are apparently of sufficient size and capacity to care for the volume of sewage which will ultimately be contributed to them, and are to be laid on gradients sufficiently steep to provide self-cleansing velocities and prevent clogging of the sewers. The sewers range in size from eight inches to twenty inches and are to consist of vitrified tile pipe, except when the sewers are carried across Wappingers creek from the western to the eastern side at High street and Main street. Cast-iron pipe is to be used at these points. At High street the sewer is to be carried across on the top of an existing dam, while at Main street the sewer is to be carried across the creek by an existing stone bridge. The 8-inch cast-iron pipe which crosses the dam at High street is shown as laid on the upstream side of the dam and close to the top. Such a location would endanger the pipe through water and ice action, and impact of materials brought down by the stream. The crossing at this point should be made by means of an inverted siphon placed below the dam.

A manhole has been placed at every change of grade or alignment. The maximum spacing between manholes is about 700 feet for an 8 inch sewer laid on a grade of 0.5%. In several instances lamp holes have been placed between manholes where the spacing is long. Although these long sections of sewers are not designed with minimum slopes, I am of the opinion that lamp holes should not be substituted for manholes on long sections of sewer and that the manhole spacing should in general not be greater than 400 feet and in no case should the distance between adjacent manholes exceed 500 feet.

The sewage from three short streets between Dutchess terrace and Wappingers creek is to be conveyed to a pumping station located near the corner of Franklindale and Market streets. From the pumping station the sewage is to be pumped to manhole No. 94 on the main trunk sewer through an 8 inch force main. The material of which the force main is to consist is not indicated on the plans nor are any details of the pump well or pump shown.

It is proposed to treat the sewage collected by this system in a sewage disposal plant located close to the southwestern boundary of the village, upon a small stream which discharges into Wappingers creek about 600 feet below the plant. The creek has a watershed area above the point of discharge of about 14 square miles, while Wappingers creek has a watershed the area of which above the junction with the first mentioned creek is about 202 square miles. Assuming a minimum runoff of 0.1 cu. ft. per second per square mile of watershed area a flow of 1.4 cu. ft. per second is obtained for the branch stream into which the effluent from the disposal plant is to be discharged. A flow of 20.2 cu. ft. per second is obtained for the main stream before it is joined by the branch and a total of 21.6 cu. ft. per second for the combined streams below the junction. For the present population of 3,900 and a future population of 6,000 a flow of 0.36 cu. ft. per second per 1,000 population is obtained for the present and of about 0.23 cu. ft. per second per 1,000 population for the future in the branch stream. In the main stream below the junction the respective values are about 5.9 and 3.8 cu. ft. per second per 1,000 population contributing sewage. The disposal plant is close to the lower part of Franklindale street. The report of the engineer states that any other location of the disposal plant was seriously objected to by the property owners. The stream is not used for water supply purposes by any municipality except for fire and sprinkling purposes by the village of Wappingers Falls which according to maps on file in this Department pumps the water to a reservoir located on the western side of the creek.

The plans propose that upon reaching the disposal plant the sewage is to be passed into the distributing trough of a settling tank of the Imhoff radial flow type. The elevation of the flow line in the settling tank, of the parts of the settling tank itself or of the other parts of the disposal works such as the sludge bed or of the water in the creek are shown on any of the plans at present submitted to the Department. The sewage is then to flow over
outer circumference of the circular distributing trough, located in th
of the tank, into a settling compartment for the settling
A concrete baffle is shown to be placed approximately

settling compartment which diverts the flow of sewage downward toward the slot connecting the settling compartment with the sludge chamber. After passing beneath the baffle the sewage uses and overflows the outer edge of the settling compartment into a collecting trough which conveys it to the outlet pipe. A wooden scum board which extends about 2 feet below the surface of the sewage in the tank, is supported in front of the overflow weir over which the sewage flows into the collecting trough. The sewage is to discharge without further treatment into a branch of Wappingers creek about 600 feet above its junction with the main creek. The effluent pipe from the settling tank to the creek is not shown on the plans.

The settling compartment of the Imhoff tank has a capacity of about 69,900 gallons which for a population of 3,000 and a per capita sewage contribution of 100 gallons per day gives a period of detention of the sewage in the tank of about 4.8 hours. For a population of 10,000 and the same assumption regarding sewage contribution a period of detention of 1.7 hours is obtained. The velocity of vertical flow in the settling compartment after the sewage passes under the baffle is about 0.054 feet per minute for a population of 3,900 and about 0.147 feet per minute for a population of 10,000.

The sludge compartment has a capacity of about 3,330 cubic feet which allows about 0.8 of a cubic foot per person for the present population of 3,900 and about 0.6 of a cubic foot per person for a future population of 10,000. A possible period of detention of the sludge chamber of 5 months is obtained for a population of 3,000 and about two months for a population of 10,000.

The sludge is to flow by gravity through a sludge pipe located in the central well of the tank. The size of the sludge pipe is not indicated on the plans. This sludge pipe should be at least 9 inches in diameter, of cast iron and a valve should be located in it near the outer wall of the Imhoff tank so that the flow through it may be cut off. A sludge bed having an area of approximately 3,300 square feet is provided for the disposal of the sludge. This sludge bed is to be constructed of graded gravel overlain by coarse sand and it is to be underdrained by 4-inch tile pipes spaced 4 feet 9 inches on centers and connecting with an 8-inch main underdrain. The main underdrain discharges directly into the creek. The size and spacing of underdrains is not shown on the plan or cross sections of the sludge bed although the above information is included in the specifications.

In view of the results of our examination of these plans and after careful consideration of the essential features of the design and of the local and general requirements with respect to proper methods for the disposal of sewage from the proposed sewer system it appears that while the plans in general are satisfactory there are several modifications and additions which should be made before they be approved.

It is evident that the discharge of effluent from the plant should not be into the small stream tributary to Wappingers creek but that the effluent pipe should be shown by the plans to extend from the disposal plant into Wappingers creek below low water mark. The disposal plant appears to be properly designed, although with a proper time of detention, say 2½ hours, the population which the settling tank will probably care for will not exceed 6,000 people. If the low level section between Dutchess Terrace and Wappingers creek is to be constructed at once, the detailed design of the pumping station should be submitted with the plans.

I beg to recommend therefore that these plans be returned for correction, additions or modifications in the following respects:

1. That the gravity sewer crossing Wappingers creek at the dam near High street be changed to an inverted siphon creek crossing.
2. That the spacing between adjacent manholes be reduced to 400 feet in general and in no case not greater than 500 feet.
3. That the plans be revised to show an effluent pipe from the disposal plant to be constructed to a point below low water in Wappingers creek and that no discharge of effluent into the creek tributary to Wappingers creek be shown by the plans.
4. That general plans for additional or supplementary works for more complete treatment of sewage be shown by the plans.

Albany, N. Y., April 30, 1914

Amended plans for sewerage and sewage disposal for the village of Wappingers Falls, Dutchess county, were again submitted to this Department for approval by the Board of Trustees on September 9, 1914.

Plans revised in general accordance with the above recommendations but providing for the substitution of a Riensch-Wurl screen for the proposed Imhoff tank were resubmitted for approval on July 17. Our examination of these revised plans showed that although an inverted siphon had been proposed by such plans to cross Wappingers creek at the dam as recommended, no operating head had been provided for in the siphon.

The Riensch-Wurl screen was shown to be located in an underground chamber covered with a concrete roof provided with manholes. The plans also provided for a by-pass around the screening plant. The plans were, furthermore, lacking in details and were, therefore, returned to the designing engineer on August 19 with the recommendations that an operating head of not less than 1½ and preferably 2 feet be provided for the inverted siphon across Wappingers creek; that a building be placed over the screening plant in order to make it more accessible; that the by-pass around the plant be omitted; and that the following details be supplied:

1. Dimensions of different portions of the plant.
2. Details of bar screen giving sizes, dimensions and spacing of bars.
3. More details of the Riensch-Wurl screen, including:
    a—Diameter of screen.
    b—Sizes of perforations.
    c—Capacity of motive power to operate the screen.
    d—Auxiliary motive power to operate the screen.
4. Area for disposal of screenings.
5. Details of sterilizing plant.
6. Amount of hypochlorite in parts per million to be used.

The plans now submitted have been modified in general accordance with the above requirements. An operating head of two feet has been provided for the inverted siphon across Wappingers creek and the details of the siphon are shown. The plans also show a dosing tank and eleven contact beds having a total area of one acre as a means of supplementary treatment, should such additional treatment be required in the future. These beds are shown located on sloping ground below the proposed screening plant and each successive bed is shown at a lower elevation than the preceding bed. It would appear that it would be impracticable to construct the beds as shown and provide for dosing them alternately from a single dosing tank provided with automatic dosing devices. The design can, however, be modified when detailed plans for the contact beds are prepared should it be found desirable to install supplementary treatment works of this type in the future.

According to the report of the designing engineer the proposed Riensch-Wurl screen will have a capacity of about 860,000 gallons per day, which should be adequate as to capacity to care for the sewage of the village for a reasonable period in the future. The plans also show an area where an additional plant similar to the proposed screening plant may be constructed adjacent to this plant at some future time.

The report of the designing engineer also states that the perforations in the screen are to consist of slots one-thirty-second of an inch wide and one inch long. These perforations are considerably narrower than those of any screen of this nature in use, of which we have any reference. Most screens of this type are said to be constructed with slots varying from one-sixth to one-sixteenth of an inch in width. A screen with perforations as small as that proposed would have a tendency to clog up with grease and prevent the sewage from passing through it, inasmuch as these screens under normal conditions are operated under comparatively small heads. It would seem that further study in this respect should be given to this feature of the design and a modification of the size of the perforations of the screen made.

Although the revised plans show dimensions of different portions of the screening plant and considerably more data than the plans first submitted there are still not sufficient details furnished to permit of finally passing on the plans. The elevations of the inverts of the inlet and outlet of the plant and of the weir and other portions of the plant should be shown. The elevation of the point at which the sewage overflows into the outlet channel beyond the screen in case of clogging or stoppage of the screen should also be shown, preferably by cross sections and additional longitudinal sections through the screen chamber.

I am of the opinion, moreover, that the Riensch-Wurl screen should be installed in duplicate and that owing to the somewhat complicated mechanism of this screen, auxiliary motive power independent of and in addition to that shown by the plans, such as a gas engine and generator or simply a gas engine to operate the screen in case of a failure in the supply of the electric current, should be provided in order to give a more reasonable assurance of a continuous operation of the plant. A disposal plant of this type should also be operated under constant and intelligent supervision and a statement should be submitted by the village authorities as to what provisions are to be made to operate this plant. The plant should also be provided with a tell-tale device of some sort to warn the operator of the plant in case the level of the sewage in the plant rises above a certain predetermined elevation and in case of a stoppage of the operation of the screen. Data should also be submitted as to the efficiency of these screens, that is the percentage of suspended solids in the sewage removed by them.

So far as can be ascertained the Riensch-Wurl screen has not been used by any municipality in this country and although it is claimed to be in successful operation in a number of places in Europe it cannot be considered at this time as other than in an experimental stage in this country until more data as to its efficiency and actual operating results have been demonstrated. I am of the opinion, therefore, that any permits issued for the discharge of sewage treated by screens of this type should be issued on the condition that whenever required by this Department properly constructed settling tanks shall be substituted for the screens or that additional treatment of the effluent from the screens by sedimentation or more complete treatment of the sewage or both shall be provided for and that the village authorities should be so advised.

In this connection it should be noted that the plans show a chlorination apparatus in the screen chamber to provide for the application of liquid chlorine to the effluent from the screening plant. After the chlorine has been applied to the effluent it is planned to have it flow back and forth through three channels composed of three sections of thirty-six inch concrete pipe having a total length of about 100 feet before it reaches the outlet sewer. According to the report of the designing engineer a minimum of thirty-two parts of available chlorine per million parts of sewage treated are to be used and the chlorination apparatus is to be similar to that manufactured by the Electric Bleaching Gas Co. or the Wallace & Tiernan Co.

It would appear, however, that owing to the nature of the stream into which the sewage is to be discharged and inasmuch as only a portion of the population of the village will probably be served by the sewer system for a number of years, the discharge of properly screened or settled sewage into the stream without any further treatment would probably not create any objectionable conditions at this time. If, however, in the future, when a greater percentage of the population is served by the sewer system it becomes necessary to provide for additional purification of the effluent, a chlorination plant or contact beds or other works for more complete treatment of the sewage may at such time be installed after plans for the same shall first have been approved by this Department.

In conclusion I would state that it is found from our examination of the plans now under consideration that although they have been revised in general accordance with the requirements of the Department they are not in final shape for acceptance and that certain additions and modifications of which the following are the more important should be made before the plans are passed upon:

1. The elevations of the inlet and outlet and other portions of the disposal plant should be shown.
2. The proposed screens should be installed in duplicate and auxiliary *motive power to* drive the screens in addition to and independent of that

requirement with respect to the disposal of sewage for the village, I would recommend that the plans be approved and a permit be issued allowing the discharge into Wappingers creek, of effluent from the proposed sewage disposal plant.

ALBANY, N. Y., *October* 13, 1914

PERMIT

A permit, containing the following conditions, was issued in connection with the approval of the plans on October 20, 1914:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary.
2. That the issuance of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.
3. That both the sewer system and the sewage disposal works shown by plans approved this day shall be fully constructed in complete conformity with such plans or approved amendments thereof.
4. That only sanitary or domestic sewage, and no storm water or surface water from the streets, roofs or other areas shall be admitted to the proposed sewers, or sewage disposal works.
5. That no sewage sludge from any part of the disposal works shall be discharged into Wappingers creek or any other watercourse.
6. That the proposed screening plant shall be continuously and at all times properly operated and maintained.
7. That not less than 20 parts of available chlorine per million parts of sewage shall be properly applied at all times to the effluent from the screening plant.
8. That whenever required by the State Commissioner of Health, satisfactory detailed plans for additional works for more complete treatment of the sewage of the village shall be submitted for approval; and thereafter upon approval of said plans any or all portions of such additional works for more complete treatment of sewage shall be constructed and put in operation at such time or times as said commissioner may designate.

WATERLOO

Amended plans providing for the construction of two sewage disposal plants consisting of Imhoff tanks and sludge beds in place of the single sewage disposal plant consisting of a septic tank, plans for which were approved on February 11, 1908, were submitted for approval on January 10, 1914. The plans were approved on January 19, 1914.

The report on the examination of plans and the conditions of the permit issued follow.

Amended alternate plans for sewage disposal for the village of Waterloo, Seneca county, were submitted to this Department for approval by the board of trustees on January 10, 1914.

Original plans for sewerage and sewage disposal for the village of Waterloo were approved on February 11, 1908. These plans provided for a comprehensive sewer system and for a sewage disposal plant consisting of a septic tank and sludge drying bed to be situated on the south side of the Seneca river which flows through the southern portion of the village. It is proposed by these plans to convey the sewage from the north or larger area of the village to the disposal plant by means of an inverted siphon.

It appears from the report accompanying the present plans that although the sewer system of the village is nearly completed the bids for the disposal plant have been twice rejected by the board of trustees on the ground of the excessive cost which it is stated is due principally to difficulties in constructing the inverted siphon under the river.

The plans now presented provide for one sewage disposal plant on each side of the river so as to obviate the construction of the inverted siphon for carrying the sewage across the stream. It is proposed to ask for bids for both the old and the new scheme and to construct the plant on which the lowest bid is received.

As pointed out to the designing engineers under date of November 28, 1913, the economy of constructing Imhoff tanks on each side of the river in place of a single septic tank on the south side as originally planned is doubtful owing to the extra expense usually involved both in the construction and maintenance of two plants instead of one. Furthermore, if it becomes necessary at some future time to provide supplementary or more complete treatment of the sewage it might be desirable or necessary to locate such supplementary treatment works on one side of the river in which case the sewage would have to be carried across the river either by pumping or by means of inverted siphons. It is stated, however, in the report of the engineers that "if at some future time, it is found necessary to unite the two effluents for further treatment, a force main across the river can be constructed at much less expense than the inverted siphon."

It appears from the report of the engineers and from the 1910 census that the population of the village has been practically the same for the last thirty years and that the population on the north side of the river is about 3,370 and that on the south side about 560. The sewage disposal plants have been designed to care for populations of 4,000 and 700 persons respectively.

The disposal plant on the north side of the river is to consist of a small screen chamber, Imhoff tanks and auxiliary sludge bed for the disposal of sludge. The sewage upon reaching the disposal plant will be passed through a small screen chamber 5 feet square in area and 5 feet deep. The screen is to be composed of ¼inch by 2 inch bars spaced one inch in the clear.

The Imhoff tank is to be of the horizontal-longitudinal flow type, 20 feet wide by 56 feet long, inside dimensions, with a depth of about 23½ feet from the flow line to the bottom of the sludge hopper. It is to be divided by means of concrete partitions into an upper or settling compartment and 3 lower hopper shaped sludge compartments for the storage and digestion of sludge. The inlet and outlet channels of the settling tank are so arranged as to permit of reversing the flow of the sewage which should tend to give a more uniform disposition of the sludge in the sludge compartments.

The settling compartment has a capacity of some 60,000 gallons equal to an average flow of a little more than 4 hours when serving the present population and should therefore be adequate to care for the population for which it is ultimately designed. The sludge compartments have a capacity of about 5,000 cubic feet and will therefore give a storage period of about 6 months. It is proposed to remove the sludge from the tank by gravity by means of 8 inch cast iron sludge pipes into the sludge well from which it is to be pumped to the adjacent sludge drying bed

This bed is to be underdrained by means of parallel lines of 3 inch tiles connected with a collecting drain varying in size from 6 to 8 inches in diameter. Above the underdrain system is to be placed filtering material graded as follows from the bottom up, 5 inches of gravel ranging in size from 2½ inches to 1 inch, 5 inches of ¼ to 1 inch gravel, 2 inches of 1/16 inch to ¼ inch gravel with a top layer of mortar sand ¼ inch thick. The bed will have a total superficial area of about 1,400 square feet equal to 350 feet per 1,000 persons served which is the area usually provided for the drying of Imhoff tank sludge.

The disposal plant on the south side of the river, which is to serve a population of nearly 600, is similar to the larger plant. The sewage upon reaching the plant is to be passed through a small screen chamber provided with an inclined bar screen. The Imhoff tank is to be about 17 feet in depth and has one settling compartment and a single sludge compartment.

The settling compartment has sufficient capacity to give from 2 to 3 hours' detention of the sewage on the basis of design used, and the sludge compartment is of adequate capacity to give a storage period of more than 6 months for the sludge when serving 600 or 700 people. The sludge is to be removed in a similar manner as in the case of the tank on the north side of the river and is to be treated on the sludge bed of similar design having an area of 400 square feet.

From our careful examination of the plans it is found that the proposed sewage disposal plants if properly constructed and if operated with care and efficiency should satisfactorily care for the sanitary sewage of the village and should produce an effluent which might safely be discharged into the Seneca river at this time.

I would therefore recommend that the plans be approved and a permit be issued allowing the discharge into the Seneca river of effluent from the proposed sewage disposal plant and that the permit contain in addition to the usual revocation and modification clauses the same conditions with reference to the future treatment of the sewage as are contained in the permit granted to the village of 1908.

ALBANY, N. Y., *January* 19, 1914

PERMIT

A permit, containing the following conditions, was issued in connection with the approval of the plans on January 19, 1914:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary.
2. That the issuance of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.
3. That the sewage disposal plants shown by plans approved this day shall be fully constructed in complete conformity with such plans or approved amendments thereof.
4. That only sanitary or domestic sewage and no storm water or surface water from streets, roofs or other areas shall be admitted to the proposed sewage disposal plants.
5. That no sewage sludge from any part of the sewage disposal plants shall be discharged into Seneca river or any other watercourse.
6. That whenever required by the State Commissioner of Health, satisfactory detailed plans for additional works for more complete treatment of the entire sanitary sewage of the village of Waterloo shall be submitted for approval; and that any or all portions of such additional or supplementary works for more complete treatment of sewage shown by said plans shall thereafter be constructed and put in operation when required by the State Commissioner of Health.

WATERTOWN

During the past year plans for proposed sewers in the streets listed below have been approved and permits issued:

Date of approval	Location of sewer	Stream receiving sewage
Feb. 13.	Hewitt st	Black river
Feb. 27.	Clinton ave	Black river
July 14.	South and North Hamilton streets	Black river
July 28.	East Division street	Black river
Nov. 10.	East Moulton and Davis streets	Black river

WATKINS

Plans for proposed sewers in North Jackson, Cross and Bath streets and Glen avenue in the village of Watkins were submitted for approval on September 18, 1914, and were approved on October 6, 1914.

The report on examination of the plans and the conditions of the permit issued in connection with the approval of them follow.

Plans for sewer extensions in the village of Watkins, Schuyler county, were submitted to this Department for approval by the board of water and sewer commissioners on September 18, 1914.

The records of the Department show that the village is provided with a sanitary sewer system, covering practically the entire village, which appears to have been constructed about 1890 without the approval of this Department.

In 1908 plans for proposed sewer extensions in First and Decatur streets were submitted for approval. These plans were not approved inasmuch as they provided for a new outlet and since it was considered undesirable to increase the amount of untreated sewage discharged into the lake without making provisions for its future treatment. In fact the approval of plans for a new outlet would have made the problem of collection and disposal of the sewage somewhat more difficult.

The village of Watkins is located near the southern part of Schuyler county at the head of Seneca lake. It is provided with an unfiltered water supply taken from Seneca lake. The water works are controlled by the municipality. The sanitary sewer system of the village discharges into the lake through a 16 inch steel pipe at a point about 900 feet from the shore opposite Porter street and about 2,000 feet from the intake of the village water supply.

The plans now presented provide for about 2,100 feet of 8 inch sanitary sewer extensions in North Jackson, Cross, and Bath streets, and Glen avenue tributary to the existing outlet sewer near the foot of Porter street. These sewers will probably never be extended more than a few hundred feet in the future and if properly constructed should be adequate as to capacity to care for the sanitary sewage of the sections to be served by them.

Consideration should, however, be given at this time to the needs for the future treatment of the sewage of the village before its discharge into the lake, not only with respect to conditions of local nuisance but also for the protection of the water supplies of the village itself as well as the supplies of the Willard State Hospital and the city of Geneva which are also taken from Seneca lake. All but Geneva use the lake water in its raw state. The menace to the Watkins water supply by the discharge of untreated sewage into the lake is, however, far greater than in the case of the other two places owing to its relatively greater proximity to the outlet sewer. Under the existing conditions there is always a possibility of the sewage of Watkins being carried direct to the intake of the village water supply under certain conditions of wind, current and eddies.

It has been the consistent policy of the Department to require, in the case of all new sewer construction, that consideration should be given to the future treatment of the sewage especially where public water supplies are involved. I am of the opinion that immediate steps should be taken by the village of Watkins to have a study made of the most suitable and appropriate means of treating its sewage and to have plans for the proper disposal of its sewage prepared and submitted to this Department for approval.

I would therefore recommend that the plans now under consideration be approved and a permit issued allowing the discharge into Seneca lake of sewage from the sewers shown by such plans on condition that detailed plans for the treatment of the entire sanitary sewage of the village be submitted to this Department for approval on or before October 1, 1915.

ALBANY, N. Y., *September 25, 1914*

PERMIT

A permit, containing the following conditions, was issued in connection with the approval of the plans on October 6, 1914.

> 1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary.
>
> 2. That the issuance of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.
>
> 3. That only sanitary or domestic sewage, and no storm water or surface water from streets, roofs or other areas shall be admitted to the proposed sewers.
>
> 4. That on or before October 1, 1915, satisfactory detailed plans for intercepting and outfall sewers to convey the entire sanitary sewage of the village of Watkins to a suitable site for sewage disposal works, together with detailed plans for sewage disposal works to treat the entire sanitary sewage of the village shall be submitted to this Department for approval; and upon approval of said plans any or all portions of the intercepting and outfall sewers and of the sewage disposal works shall thereafter be constructed whenever required by the State Commissioner of Health.

WESTFIELD

Plans for proposed sewers in Jackson, Davis and Billsboro streets in the village of Westfield were submitted for approval on August 25, 1914, and were approved on September 10, 1914.

The report on the examination of plans and the conditions of the permit issued in connection with the approval of them follow.

Plans for proposed sewer extensions in the village of Westfield, Chautauqua county, were submitted for approval by the board of trustees of the village on August 25, 1914.

These plans were first submitted for approval on June 26 but inasmuch as they were not in duplicate and were not accompanied by application for their approval from the board of trustees, the plans were returned on June 29.

The village of Westfield is located in the northern part of Chautauqua county on Chautauqua creek about one mile from Lake Erie. The village has an estimated population of about 2,400 persons. Plans for a comprehensive sewer system and for a sewage disposal plant consisting of septic tanks and contact beds tributary to Chautauqua creek were approved by this Department on June 20, 1910.

The plans now presented provide for comparatively short sewers in Jackson, Davis and Billsboro streets. According to the application submitted with the plans Davis street has been extended to Third street a distance of about 400 feet and required modification of the plans originally approved which showed a sewer about 100 feet long in this street. It appears also that Billsboro street is a new street which requires sewerage facilities. The plans also provide for modifying the sewer in Davis street. The original plans showed the westerly section of this sewer tributary to the Crandall street sewer. It is now proposed to make the entire sewer in this street tributary to the Ash street sewer.

All of the proposed sewers are to be 8 inches in diameter and are to be constructed with slopes of from 1.32 per cent. to .4 per cent. Flush tanks are to be provided at the upper ends of the sewers in Davis and Jackson streets and a lamp hole is shown by the plans at the upper end of the proposed sewer in Billsboro street. This sewer which is to be 600 feet long is to be constructed with a slope of .4 per cent. No intermediate manhole on this sewer is shown by the plans. I am of the opinion that owing to the length of the proposed Billsboro street sewer and the comparatively flat slope on which it is to be constructed, additional facilities should be provided for cleaning and inspecting the sewer. A manhole or flush tank should be constructed at the upper end of the sewer and an intermediate manhole should be placed half-way between the upper and lower ends of the sewer.

In view of the above I would recommend that the plans be approved and a permit be issued allowing the discharge of sewage from the proposed sewers into Chautauqua creek after such sewage shall first have been passed through the village disposal plant. I would further recommend that the permit contain in addition to the above requirement the condition that a manhole or flush tank be placed at the upper end of the sewer in Billsboro street and that a manhole be installed midway between the upper and lower ends of this sewer.

ALBANY, N. Y., *September* 2, 1914

PERMIT

A permit, containing the following conditions, was issued in connection with the approval of the plans on September 10, 1914:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary.
2. That the issuance of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.
3. That only sanitary or domestic sewage and no storm water or surface water from streets, roofs or other areas shall be admitted to the proposed sewers.
4. That all the sewage to be collected by the proposed sewers shall first be passed through the sewage disposal plant of the village of Westfield before it is discharged into Chautauqua creek.
5. That a manhole or a flush tank shall be placed at the upper end of the sewer in Billsboro street and that a manhole shall be installed midway between the upper and lower ends of this proposed sewer.

WEST SENECA (Sewer District No. 1)

Plans for a proposed sewer system in sewer district No. 1 in the town of West Seneca tributary to the Buffalo sewer system were approved on July 14, 1914. The report on the examination of plans and the conditions of the permit issued follow.

Plans for a proposed sewer system for sewer district No. 1 of the town of West Seneca, Erie county, were submitted to this Department for approval by the town board and the board of highway superintendents on June 28, 1914. An application for the approval of the plans signed by the supervisor and chairman of said boards together with a copy of an agreement made between the city of Buffalo and the town of West Seneca on June 19, 1914, in accordance with chapter 443 of the Laws of 1906 were also submitted.

The sewer district comprising an area of some 120 acres is located north of Cazenovia creek adjoining the southeastern portion of the city of Buffalo. The plans show that it is proposed to construct a comprehensive sewer system covering all developed portions of the district. The proposed sewers are to vary in size from 8 to 20 inches in diameter.

All of the sewers have been designed with slopes sufficiently steep to keep the sewers clean under ordinary conditions. Manholes are to be constructed at all points of change of slope and alignment and at intermediate points of straight alignments not more than 400 feet apart except in one or two cases. It appears, therefore, that adequate facilities for inspection and cleaning of the sewers are provided and I am of the opinion that if properly constructed the sewers should satisfactorily care for the sanitary sewage of the sewer district.

It is proposed to connect sewers from the proposed system with the existing 42" sewer of the Buffalo sewer system at Beyer Place. This sewer extends southwesterly through Cazenovia park in Buffalo and discharges into Cazenovia creek at Meriden street, about one mile above its confluence with Buffalo creek. A large portion of the sewage of the city of Buffalo is at present being discharged without treatment into Buffalo creek and no public water supply is derived from this stream below the outlet sewer.

The agreement made between the city of Buffalo and the town of West Seneca shows that the city through its commissioner of public works has agreed to care for the sanitary sewage, factory waste and roof water from sewer district No. 1 of the town of West Seneca for a period of 10 years from January 1, 1915, on condition that the town pay to the city the sum of $390.00 annually for the use of the connection with the city sewer system and an additional sum of $15.00 annually for the repair and maintenance of the city sewers. The agreement further provides among other things that the city may terminate this contract at the end of 10 years from January 1, 1915, or at any time thereafter upon one year's notice to the supervisor of the town of West Seneca or his successor in office; and that if the city makes any changes in the sewers through which the 20-inch sewer connection of the town sewer discharges or if the city installs any sewage treatment, interception or disposal works which include this flow of sewage from the district an amount proportional to the discharge of such 20-inch connection to the total amount so intercepted or treated shall be paid by the town of West Seneca to the city of Buffalo.

It appears, therefore, that the city of Buffalo will be responsible for the proper care and disposal of the sewage of this sewer district for a period of not less than 10 years. The report of the town engineer also states that it is probable that before this period expires some other and more permanent arrangement to care for the sewage will be made.

In view of the above I would recommend that the plans for the proposed sewer system be approved and a permit issued allowing the discharge of sewage from these sewers into Cazenovia creek through the Buffalo sewer system at Meriden street.

ALBANY, N. Y., *July* 10, 1914

PERMIT

A permit containing the following conditions was issued in connection with the approval of the plans on July 14, 1914:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary.
2. That the issuance of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.
3. That only sanitary or domestic sewage and no storm water or surface water from streets, roofs or other areas shall be admitted to the proposed sewers.
4. That proper treatment of sewage to be collected by the proposed sewer system shall be accomplished whenever required by this Department either by arrangements with the city of Buffalo as provided for by the plans approved or by works constructed by the village in accordance with plans satisfactory to this Department.

WHITE PLAINS (Property of Mr. A. M. Greer)

Plans for a sewage disposal plant consisting of a settling tank, dosing tank and covered intermittent sand filters to treat the sewage from the property of Mr. A. M. Greer, in the town of White Plains, Westchester county, were approved on March 18, 1914.

The report on the examination of plans and the conditions of the permit issued in connection with the approval of them follow.

Plans for sewage disposal for the residence and proposed garage of Mr. A. M. Greer, in the town of White Plains, Westchester county, were submitted to this Department for approval on February 27, 1914.

The plans were prepared by Waring, Chapman and Farquhar, Civil Engineers of New York City and comprise tracings and blue prints of the following:

1. General plan showing location of sewage disposal plant with reference to house and stream.
2. Plan showing details of the disposal plant.

According to the plans and report of the Designing Engineers, the property of Mr. Greer consists of 40 acres of land situated on Rosendale avenue, 4 miles from White Plains and 3½ miles from Harrison. The residence and garage to be served by the disposal plant will contain 6 persons, including the servants. The water supply for the property is derived from a driven well located about 400 feet from the house and is estimated at about 400 gallons per day equal to a daily per capita rate of water consumption of 66 gallons.

The sewers leading from the house and the garage to the disposal plant are to consist of 4-inch vitrified tile pipes. The sewer from the house is to be laid on a slope of 2% and although the slope of the sewer from the proposed garage is not shown on the plans the report states that there is ample fall for proper grades for this sewer. It may be stated that the slope of 4-inch sewers should not be less than one per cent. in order to give self-cleansing velocities in them. If this slope cannot be obtained, the size of the sewer should be increased.

It is proposed to treat the sewage from the property in a sewage disposal plant consisting of a settling tank, dosing tank, siphon chamber and two covered, intermittent sand filters located about 60 feet from the house and about 100 feet from a small stream tributary to the East branch of the Mamaroneck river. This stream has a very small drainage area, possibly less than 100 acres above the disposal plant and discharges into the upper reservoir on the New York Interurban Water Co., about ¼ mile from the property. The intake of the water company at its lower reservoir is about 2¾ miles from the property. The water supply furnished by this company is filtered through mechanical filters of the pressure type and supplies the village of Mamaroneck and adjacent municipalities.

The proposed settling tank which is to be covered is to be a masonry structure with a concrete bottom and dome shaped roof provided with a manhole. The tank is to be 7 feet in diameter and 3½ feet deep below the flow line affording a capacity of about 1,000 gallons equal to an average flow of 2½ days on the basis of design used. From the settling tank the clarified sewage is to flow through a submerged inlet to the proposed dosing tank.

This tank, which is similar in design to the settling tank, is 5 feet, 3 inches in diameter and one foot deep below the flow line. It has a capacity of 162 gallons which is adequate to flood one of the proposed sandfilters to a depth of about 1¾ inches at each discharge. The discharge siphon is located in a small chamber adjacent to the dosing tank. The pipe leading from the siphon connects with a two-way gate chamber by means of which the clarified effluent may be discharged into either of the two proposed filters. It is planned to operate only one of the filters at a time.

Each of the two sand filters is 15 feet long by 10 feet wide giving a total area of 300 square feet. The filters are to be excavated to a depth of from 4½ to 5 feet, and are to be filled to a depth of 3 feet with clean coarse sand overlying a bottom layer of gravel. The sides of the filters are to be lined with 2-inch planks. The bottom of each bed slopes towards a central valley 6 inches deep in which is to be laid a single line of 4-inch tile underdrain surrounded and covered with gravel.

The filters are to be covered with 2-inch plank roofs covered with tar paper above which is to be a top filling of earth from 4 inches to 1 foot deep. The roofs are to placed 6 inches above the surface of the sand and are to be supported on beams resting on single lengths of vitrified tile which in turn rest on slabs of concrete about 1 foot square. The top of these tile pipe supports extend from within a couple of inches above the surface of the sand to about 1 foot above the underdrains. It appears that with the proposed arrangement there is an opportunity for a direct flow of sewage passing down through the pipes from the surface of the filters to the underdrains and that the pipes should either be filled with concrete or wooden or solid concrete piers should be substituted for the tile pipe supports.

The combined area of the filters is about .007 of an acre and will provide for a rate of operation of 85,000 gallons per acre per day on the basis of a daily per capita rate of sewage contribution of 100 gallons. Although this rate would be moderate for open sand filters it appears to be too high for this type of filter when covered and where there is little or no opportunity for aeration. I am of the opinion that, in view of the nature of the stream into which the effluent is to be discharged, a rate of 50,000 gallons per day based on a daily per capita rate of flow of 100 gallons should not be exceeded and that ventilating pipes should be provided to facilitate aeration of the filters.

The general plans of the disposal plant show the outlet or effluent pipe from the sand filters terminating at a point about 60 feet from the stream, and a note on the plans states that the outlet is to be exposed on the surface of the ground or connected with a drain leading from a spring to the stream. The spring is to be abandoned. It appears, however, that with either of the proposed arrangements at least some of the effluent will reach the stream.

In conclusion I would state that it is found from our careful examination of the plans that the proposed sewage disposal plant if modified in certain respects as noted above, should satisfactorily care for the sewage of the Greer property and produce an effluent that might be discharged into the branch of the Mamaroneck river without objection at this time.

I would therefore recommend that the plans be approved.

ALBANY, N. Y., *March* 17, 1914

PERMIT

The permit issued in connection with the approval of the plans on March 18, 1914, contains the following conditions:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary.
2. That the issuance of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.
3. That both the sewers and sewage disposal works shown by plans approved this day shall be fully constructed in complete conformity with such plans or approved amendments thereof except as provided in condition 6 of this permit.
4. That only sanitary or domestic sewage and no storm water or surface water from streets, roofs or other areas shall be admitted to the proposed sewers.
5. That no sewage sludge from any part of the disposal works shall be discharged into Marmaroneck river or any tributary thereto or into *any other* watercourse or body of water.

6. That the proposed sand filters when constructed shall have a total area of not less than 525 square feet; and the pipes shown by the plans to support the roof of these filters shall either be filled with concrete or replaced by stone, or wooden columns.

7. That the amount of sewage to be regularly passed through the sewage disposal plant is hereby limited to that contributed by six persons unless the capacity of such sewage disposal plant shall be increased in accordance with plans approved by this Department.

YONKERS (German Odd Fellows Home)

Plans for the sewage disposal plant consisting of a settling tank, dosing chamber and subsurface irrigation system, to care for the sewage from the German Odd Fellows Home in the city of Yonkers, were submitted for approval on August 10, 1914. Plans, however, were not in satisfactory condition for approval and were, therefore, returned for revision on August 25, 1914. Plans revised in accordance with the requirements of this Department were resubmitted for approval on October 3, 1914 and were approved on October 13, 1914.

The reports on the examination of plans and the conditions of the permit issued follow.

Plans for sewage disposal for Odd Fellows' Home under construction at Yonkers, N. Y., were submitted to this Department for approval on August 10, 1914.

The proposed institution is to cover an area of about 20 acres situated on the north side of the Yonkers and Tuckahoe highway, about 700 feet east of Sprain brook, a tributary of the Bronx river and 2,500 feet below and south of Grassy Sprain reservoir from which the city of Yonkers derives a portion of its water supply. No public water supplies are taken from the brook or the Bronx river below. There is to be a population of 300 persons at the institution and the water consumption is estimated at 33,000 gallons per day, equal to 110 gallons per capita per day. The storm water from the property is to be cared for in a storm water system.

It is proposed to care for the sanitary sewage of the institution in a sewage disposal plant consisting of a settling tank, dosing chamber and subsurface irrigation system to be located on the westerly side of the Home. It appears that the area available for disposal amounts to about four acres.

The proposed settling tank is to be covered and is to be divided by means of an 8-inch wall into two compartments. It is to be provided with submerged inlets and baffle boards are to be located near the inlet and outlet ends of the tank for the purpose of distributing the flow and preventing the scum from floating out into the dosing chamber. Each compartment of the tank is to be 19½ feet long, 5½ feet wide and about 6½ feet deep below the flow line giving a capacity of about 10,000 gallons, equal to an average flow of about 8 hours.

No provisions are made by the plans, however, for shutting off the flow from either of the two compartments of the tank nor are any provisions made for removing and disposing of the sludge from the tank. If it is possible to drain the tank and discharge the sludge by gravity flow to a suitable place for disposal, each compartment should be provided with a sludge pipe. The inlets and outlets of the tank should be so arranged as to permit of shutting off the flow from one compartment during cleaning without disturbing the flow through the other compartment. If it is not possible to drain the tank by gravity flow, a statement should be submitted by the engineer as to the proposed method of caring for the sludge. In either case a suitably designed sludge bed for the drying of the sludge or a furrowed field should be provided where the sludge may be discharged into trenches and covered over or plowed under.

From the settling tank the clarified effluent is to flow over weirs into an adjacent dosing chamber. This chamber is to be provided with two discharge siphons of the Miller type by means of which the sewage may be discharged alternately to any two of the three proposed subsurface irrigation fields. It is planned to augment the dose from the dosing chamber by drawing down the liquid in the settling tank about 8 inches at each discharge of the siphon.

The proposed subsurface irrigation field is to be divided into three systems containing 7,000 feet of distributing tile, each equal to about 70 feet per person. The distributing system is to consist of 8-inch and 6-inch main distributors composed of vitrified tiles laid with tight joints at slopes of .5% and the laterals are to consist of 4-inch agricultural tile. These tiles are to be laid with open joints and the joints are to be protected by terra cotta caps. It is planned to lay lines of distributing tile 4 feet apart and at a depth of from one to two feet below the surface of the ground. The system will cover an area of about two acres and will therefore be required to operate at the rate of about 15,000 gallons per acre per day on the usual assumptions as to per capita rates of sewage contribution.

According to the report of the designing engineer it appears that although the soil at one of the beds is sand of fairly good quality the soil at the other beds is more impervious. In view of this fact and owing to the comparatively large number of people to be cared for in a system of this kind, it would be much safer to increase the area of each field by 50%. This could be done without increasing the number of feet of tile in the system by spacing the lines of the distributing tiles 6 feet instead of 4 feet apart.

In conclusion I would state that it appears from our examination of the plans that the proposed sewage disposal plant has been designed in general to meet the local requirements for sewage disposal. There are, however, certain modifications which should be made before the plans are in shape for final acceptance.

I would therefore recommend that the plans be returned to the designing engineer and he be advised to modify them in the following respects:

1. The settling tank should be so arranged as to permit of shutting off the flow from either of the two compartments without disturbing the flow of the other compartments.
2. Provision should be made for the removal of sludge by gravity flow if possible to a suitable site for disposal.
3. The plans should show a suitably designed sludge bed for the drying of sludge or a suitable area on which the sludge may be disposed of in furrows or by plowing under.
4. The area of the subsurface irrigation system should be increased by not less than 50%.

ALBANY, N. Y., *August* 25, 1914

The plans were acordingly returned for modifications on August 26. 1914.

Revised plans for sewage disposal for the German Odd Fellows' Home at Yonkers, Westchester county, were submitted to this Department for approval on October 3, 1914.

Plans revised in general accordance with the above recommendations were resubmitted for approval on September 9, but inasmuch as they did not contain sufficient data to permit of final examination of them they were again returned to the designing engineer on September 10, with the following recommendations:

1. That the slope of the sludge pipe be indicated on the plans.
2. That the slope of the main and lateral distributing pipes of the subsurface irrigation system be shown.
3. That the depth at which it is proposed to lay the distributing tiles below the surface of the ground be shown.
4. That the size of the valves to be used on the sludge pipes be indicated.

Our examination of the plans now presented show that they have been revised in accordance with the requirements of the Department. The inlets and outlets of the proposed settling tank have been so arranged that either *or both* compartments of the tank may be operated at one time. The capacity of the tank has also been reduced somewhat by decreasing its depth so that when serving the estimated maximum future population of the institution of 300 persons, a time of detention of 5½ hours instead of 8 hours will be provided for. This time of detention is somewhat smaller than usual for plain settling tanks serving comparatively small populations where a large fluctuation in the rate of flow of the sewage may be expected and it is important, therefore, that the tank shall be properly operated and that the sludge should not be allowed to accumulate more than three or four months without removing it in order that it may not materially reduce the capacity and efficiency of the tank.

Provisions are made for removing the sludge from the tank by gravity flow through a 5-inch vitrified tile sewer laid on a slope of 2 per cent. The proposed sludge field is located from 320 to 480 feet from the settling tank and institution respectively. According to the report of the designing engineer the sludge disposal field is to have an area of about 600 square feet and the sludge is to be discharged into trenches in the field and plowed under.

Although the areas reserved for the subsurface irrigation system cover about 3½ acres divided into 3 fields the designing engineer stated in his report on the plans that only about 2½ acres of this area can be utilized for disposal purposes. This will, therefore, provide for a rate of operation of about 12,000 gallons per acre per day which rate does not appear to be excessive in view of the conditions of soil found at the disposal plant site and considering that the distributing systems will contain about 70 feet of tile per person served. It appears, moreover, that there is an area to the south of the proposed disposal fields which could probably be utilized as an auxiliary disposal field if necessary in the future.

The distributing systems of the fields are to consist of 6 and 8-inch main feeders and distributors and 4-inch hexagonal laterals. The main feeders and distributors are to be laid on slopes of 1.5 and .5 per cent respectively. The laterals are to be laid on slopes of from .125 per cent to .25 per cent. So-called equalizing chambers are to be located on the main distributors of the different systems where the slope of the ground is steeper than the proposed slope of the distributing tile. These equalizers provide for breaking the slope of the pipe and for back watering a portion of the distributing system above each equalizer. The tiles are to be laid at a depth of from 8 inches to 24 inches below the surface of the ground and the joints of the lateral distributors are to be protected with strips of tar paper 4 inches wide covering the top and sides of the pipe.

From our careful examination of the plans it appears that the proposed sewage disposal plant if properly constructed and operated with care and efficiency should satisfactorily care for the sanitary sewage of the institution and I would, therefore, recommend that the plans be approved on condition that if the number of persons served by the plant exceeds 300, it shall be modified or enlarged in accordance with plans to be approved by this Department. It should not be necessary, however, to issue any permit in connection with the approval of the plans inasmuch as no discharge of sewage or sewage effluent into any stream or watercourse or other body of water is contemplated by them.

ALBANY, N. Y., *October* 6, 1914

The plans were accordingly approved on October 13, 1914.

YORKVILLE

Plans for proposed sewer extensions in Maynard avenue and other streets in the village of Yorkville were approved on July 14, 1914.

The report on the examination of plans and the conditions of the permit issued in connection with the approval of them follow.

Plans for proposed sewer extensions in the village of Yorkville, Oneida county, were submitted to this Department for approval by the Board of Trustees on July 7, 1914.

Plans for a comprehensive sanitary sewer system and a sewage disposal plant consisting of a double compartment settling tank were approved on October 7, 1910. On September 13, 1913, amended plans for sewerage providing for a 12-inch sewer in Erie street to be constructed to convey the sewage from the southwestern portion of the village to the outfall sewer from the south side were approved.

The plans now presented show that it is proposed to construct comparatively short sewer extensions in Maynard avenue, Taber place, Meyer place, Champlain avenue, and Erie street in the southeastern portion of the village. All of the sewers except the proposed sewer in Erie street are to be constructed of 8-inch vitrified tile pipe. The Erie street sewer is to be a 12-inch sewer with a slope of .22 per cent. and constitutes a slight modification of the plans approved last year which called for a 12-inch sewer with a slope of .32 per cent. in this portion of Erie street.

All the proposed sewers except the Erie street sewer are to be provided with rather steep grades which should produce self-cleansing velocities. Manholes are to be constructed at all points of change of slope and alignment and at the upper ends of the sewers except in Maynard avenue, where the sewers terminate in temporary lamp holes. The plans indicate that the sewers on this street are to be extended in the future and the lamp holes eliminated.

It appears from our examination of the plans that the proposed sewers are satisfactory as far as velocities, capacities, facilities for cleansing and inspection are concerned and I would, therefore, recommend that the plans be approved and a permit be issued allowing the discharge in the Mohawk river of sewage from the proposed sewers after such sewage shall first have been passed through the village sewage disposal plant.

ALBANY, N. Y., *July* 11, 1914

PERMIT

The permit issued in connection with the approval of the plans on July 14, 1914, contains the following conditions:

1. That this permit shall be revocable at any time or subject to modification or change when in the judgment of the State Commissioner of Health such revocation, modification or change shall become necessary.
2. That the issuance of this permit shall not be deemed to affect in any way action by this Department on any future application that may be made for permission to discharge additional sewage or effluent into the waters of this State.
3. That only sanitary or domestic sewage and no storm water or surface water from streets, roofs or other areas shall be admitted to the proposed sewers.
4. That all the sewage to be collected by the proposed sewers shall, before its discharge into the Mohawk river, be first passed through the village sewage disposal plant.

INDIVIDUAL PERMITS ISSUED DURING 1914, UNDER SECTIONS 76 AND 78 OF CHAPTER 49 OF THE LAWS OF 1909, THE "PUBLIC HEALTH LAW," CONSTITUTING CHAPTER 45 OF THE CONSOLIDATED LAWS

LOCATION	To whom issued	Date	Waste matter	Discharged into —
Clay (town), Onondaga county...	H. T. Bonsted................	June 6	Effluent from disposal plant to treat sewage from hotel at Clay.	Tributary to Oneida river.
Clay (town), Onondaga county...	Ward A. Moulton............	April 10	Effluent from settling tank to treat waste water and washings from kraut and pickle factory.	Tributary to Oneida river.
Clay (town), Onondaga county...	The J. Weller Co.............	Aug. 20	Effluent from settling tank to treat waste water and washings from kraut and pickle factory.	Tributary of Oneida river.
Eagle (town), Wyoming county...	Borden's Condensed Milk Co...	Nov. 10	Effluent from settling tank to treat waste water and washings from creamery at Bliss.	Wiscay creek.
Gilboa (town), Schoharie county..	Mutual Milk and Cream Co....	April 6	Effluent from settling tank to treat waste water and washings from creamery at South Gilboa.	Bear Kill creek.
Henderson, Jefferson county.....	The Henderson Butter and Cheese Factory.	Aug. 20	Effluent from settling tank to treat waste water and washings from factory at Henderson.	Big Stony creek.
Ira (town), Cayuga county......	Lehigh Valley Railroad Co......	Nov. 23	Effluent from plant to treat waste water and washings from milk station of said company.	Little Sodus creek.
Leyden (town), Lewis county....	The Talcottville Cheese, Butter and Cream Co., Inc.	Sept. 21	Effluent from settling tank to treat waste water and washings from cheese factory at Talcottville.	Sugar river.
Ontario (town), Wayne county...	Wayne County Milk Products Co.......................	Aug. 20	Effluent from disposal plant to treat waste water and washings from plant of said company at Ontario Center.	Stream near plant.
Rossie (town), St. Lawrence Co...	C. J. Shoulette...............	Oct. 20	Effluent from settling tank to treat waste water and washings from cheese factory at Rossie.	Indian river.
Watertown (town), Jefferson Co..	Tuting and Hines............	Nov. 10	Effluent from settling tank to treat waste water and washings milk shipping station at Rices.	Mill creek.
Clay (town), Onondaga Co.......	I. C. Parmenter..............	Feb. 13	Effluent from sewage disposal plant to treat sewage from residence at Clay.	Tributary of Onondaga river.

GENERAL INVESTIGATIONS RELATING TO SEWERAGE AND SEWAGE DISPOSAL

In addition to the above work of examining and passing upon plans for sewerage and sewage disposal investigations of the conditions of existing sewerage and sewage disposal systems have been carried on in the following places during 1914.

AMHERST (town)

An investigation was made of sewerage conditions in that part of the town of Amherst, Erie county, which is adjacent to the city of Buffalo, August 27, 1914, by C. A. Howland, assistant engineer, in company with William H Baker, M. D., health officer of the town of Amherst, and Frederick K. Wing, civil engineer of Buffalo.

Insanitary conditions existing in the town of Amherst adjacent to the city of Buffalo were described in a report made by Edward Clark, M. D., sanitary district supervisor of district "O" upon an investigation made by him and the present investigation was undertaken at his request.

The town of Amherst adjoins the northeastern corner of the city of Buffalo. The census of 1910 gives the total population of the town as 4,629, about 24 per cent. of which is included in the incorporated village of Williamsville. An investigation was made of sewerage conditions in the village of Williamsville by a representative of this department on May 5, 1914, and in the report upon that inspection it was recommended that a proper system of sewerage and sewage disposal be installed in the village.

Due to the growth of the city of Buffalo the adjacent parts of the town of Amherst have been built up to a considerable extent. The Country club of Buffalo occupies a large tract of land not far from the city line and other estates are near it. There are three streets, namely, Caladine, Bailey and Springfield which are closely built up with smaller houses. Mr. Wing has been retained by the Country club to design a method of disposal of the sewage from the club house. The large amount of water used in the plunge, shower baths, toilets, etc., which are used by a maximum population of about 300, gives a considerable discharge of sewage from the club house. Previously cesspools had been used without success and at the time of the inspection these had filled up and the sewage was flowing over the surface of the ground. It is proposed either to build a disposal plant in the low area north of Main street or dispose of the sewage from the club house by connecting with a sewer in Kenmore avenue which will be built by the city of Buffalo. In case the first plan is used it would probably be necessary to open up a water course which is now grown up by vegetation in order to provide an outlet for the effluent from the disposal plant.

A number of houses located in Eggert road have installed modern plumbing. It appears that a part of these houses is provided with cesspools which, however, do not operate successfully because of the heavy nature of the soil. Overflow pipes from these cesspools have been connected, the engineer was informed, with the street ditch giving rise to conditions of nuisance. It is apparently not possible to dispose of the sewage in cesspools because of the fact that the underlying rock of the region is close to the surface and the soil itself is nonporous. The sewage from the house of Frank Bapst flows into a concrete settling tank, the effluent from which passes into an old gas well said to be several thousand feet deep. A similar arrangement is used to dispose of the wastes from the barn and coachman's house.

On the Lyman property are located two large cesspools which overflow through a tile drain into the above mentioned road ditch. A house recently constructed by Mr. Stimson is provided with concrete settling tanks, the overflow from which will apparently pass into the street ditch.

On Caladine street the sewage from the N. J. Glauber house is discharged into an excavation in the back yard. Although this cesspool has no walls the sewage does not seep into the ground. It is proposed to install an air tight concrete tank and to dispose of the effluent from this tank through a series of laterals comprising a system of subsurface irrigation. Due to the heavy nature of the soil, it is doubtful if this system will operate successfully.

It appears from a study of the topography of the region that the houses on Eggert road could be connected with the proposed sewage disposal plant from the Country club. It would not be possible, however, to dispose of the sewage from Caladine, Bailey and Springfield streets in this disposal plant without pumping. A considerable percentage of the property of the region is occupied by large estates and the houses are, therefore, separated by extensive lawns. A system of sewerage to care for the sewage from all of these places would, therefore, have to cover a considerable area. The other regions are more compactly built up and could be more readily sewered.

From the above inspection it appears that in that part of the town of Amherst, which is adjacent to the city of Buffalo, considerable difficulty is experienced in disposing of the sewage. Methods commonly used in suburban regions, such as cesspools and subsurface irrigation do not apparently operate successfully in this region because the underlying rock is near the surface and the soil is nonporous. There is obviously a great necessity for a proper system of sewage disposal which should be carefully designed in order that it may be adequate to provide for all of the future needs of the community. By the present methods of sewage disposal, conditions which are not only unsightly, but which also constitute a public nuisance, are created and the public health of the region is endangered.

I would, therefore, recommend that the town of Amherst take up the matter of disposing of the sewage of this region adjacent to Buffalo and that they take steps as provided in Section 460 and recent amendments of the Town Law dealing with the establishment of sewer districts in the towns surrounding Buffalo, to employ a competent engineer to design plans for a system of sewerage and sewage disposal. Such plans should be submitted to this department for approval as required by the Public Health Law.

I would recommend that a copy of this report be transmitted to the local board of health.

ALBANY, N. Y., *September* 10, 1914

A copy of this report was enclosed in a letter addressed to the local board of health on September 12, 1914, urging that steps be taken to carry out the recommendations of the report.

BALLSTON SPA

An investigation of the conditions of operation of the village sewage disposal plant at Ballston Spa, Saratoga county, was made by C. A. Howland, inspecting engineer, on January 5 and 9, 1914, and samples of the sewage before, during and after treatment in the disposal plant were collected and analyzed through the cooperation of the Hygienic Laboratory.

A similar inspection of the operation of the disposal plant was made in February, 1908, by C. F. Breitzke, former assistant engineer, and in the report submitted upon that inspection the village authorities were advised to:

1. Change the present methods of operation so that the plant will be run so that there will be a continuous flow through the septic tanks at a uniform rate during the whole of each day, a condition required by this department when the plans were approved.
2. To require of the American Hide and Leather Company that all wastes discharged from their tannery into the sewers of the Ballston Spa system shall be first freed from all suspended matter.

In explanation of the above recommendations and of the situation in general at Ballston Spa it may be said that a large proportion of the sewage which reaches the disposal plant is contributed from the tannery of the American Hide and Leather Company. The inspection included, therefore, both an investigation in reference to the wastes resulting from the processes of tanning used by the above company and of the treatment of these wastes before their discharge into the village sewer system. For convenience this report will be divided into two parts dealing separately with the village disposal plant and the American Hide and Leather Company's works.

The construction of the Ballston Spa sewage disposal plant is described in detail in the report on the investigation made in 1908. It will not be necessary, therefore, at the present time to repeat this description. Those features of construction and operation which have since been changed or modified will be considered and reference is made to the above report for a more detailed discussion.

The disposal plant, which consists of three settling tanks, four primary contact beds, four secondary contact beds and sludge bed, has apparently not been radically changed since the inspection in 1908. A number of modifications have been made, however, in general accordance with the recommendations of this Department. The flow through the settling tanks is now maintained at a nearly constant rate throughout the twenty-four hours. One pump operated continuously as shown by the continuous curves on the pressure indicator cards, is sufficient to pump the daily flow of sewage to the disposal plant. At infrequent intervals when a heavy storm occurs or the flow in the sewers is otherwise increased, both pumps are necessary for a short time. The inspector was informed by Mr. J. H. Lowell, who had charge of the disposal plant, that the pump, which has three cylinders, 12 by 14 inches, makes 34.1 revolutions per minute. Using this data a discharge of 913,000 gallons per twenty-four hours, allowing 10 per cent. for slippage in pumps, is obtained. As the disposal plant was designed for a capacity of 1,000,000 gallons per day, the flow is apparently approaching the amount for which the plant was designed and for which plans were approved by this Department.

The sewage passes first through a receiving basin which has a capacity of about 30 per cent. of the total daily flow giving a period of detention in the receiving basin of approximately 6.5 hours.

For a flow of sewage of 913,000 gallons per day as determined from the pump discharge, the settling tanks with a combined capacity of about 655,000 gallons give a period of detention of approximately 17 hours or a rate of flow through the tanks of about .005 feet per second. At the time of the inspection, no scum was apparent on the surface of the sewage in the settling tanks, which were last emptied and cleaned on December 13, 1913, i. e., somewhat less than a month before the inspection. The flow through the tanks was apparently uniform and undisturbed. At the outlet end the effluent passes over a broad weir onto a coke filter about two feet wide by two feet deep extending across the entire width of the tanks. The outside wall of the coke filter is perforated. One end of this filter was clogged to such an extent that the sewage flowed over its top directly into the collecting channel instead of through the perforations in the wall as intended. The inspector was informed that this filter is cleaned weekly and had been last cleaned about one week previous to the inspection. The collecting channel is scrubbed out, the clogged coke is replaced by fresh coke of which a supply is kept at the plant, the cleaning being done in the effluent from the settling tanks. At the time of cleaning the coke, the outlet to the diverting chamber of the primary contact beds is closed and an outlet in the end of the collecting channel is opened allowing the sewage to flow onto land adjoining the sludge bed. The effluent from the settling tank is diverted onto the land through a sluice way and ditch during cleaning, and spreads out toward Kayaderosseras creek, its nearest point being probably less than 50 feet from the creek. This operation requires 40 minutes and therefore about 25,000 gallons are thus disposed of weekly. There was no evidence, however, to show that the sewage had recently reached the creek.

From the settling tanks the sewage flows to a diverting or valve chamber where it is diverted in turn onto each one of four primary contact beds. The dosing of the beds is controlled by hand, three men in shifts of eight hours each looking after the work. About one hour and forty-five minutes are required to fill a primary bed which stands full two hours; about two hours are required to drain it onto the secondary bed which stands full about two hours and requires about two hours to drain into Kayaderosseras creek. The sewage in the primary beds is allowed to reach about one-half inch from the top of the surrounding walls, completely flooding the top of the contact material. The coarse stone which comprises the primary contact bed material is covered with a black zoogloea scum or sludge which has apparently become quite thick in places. This feature is further brought out by the fact that when one of the primary beds (No. 2) was being filled the sewage flowed for a considerable distance over the bed to an old gauge pipe extending vertically through the bed. At one time float gauges were installed in the beds with the intention of showing directly the height of sewage in the bed. A vertical tile pipe contained the float. The gauges did not operate successfully and the floats were taken out leaving the vertical pipes in place. The sewage, instead of sinking at once into the bed, flowed in this gauge pipe down which it passed. After the filling is complete and the flow of sewage on the bed is cut off, the sewage settles somewhat which is probably due to the escape of air.

In the previous report referred to above the time of filling a primary bed is given as 2 hours, 10 minutes, but the present inspection showed that this time has decreased to about 1 hour, 45 minutes. Previously the beds were not operated throughout the twenty-four hours, and the flow of sewage during operation is given in the 1908 report as 560,000 gallons in 5.5 hours, i. e., 1,700 gallons per minute or about 1,060 gallons per minute greater than at present. The decreased time of filling, therefore, would indicate an increased clogging of the beds as compared with the conditions of the beds in 1908.

Samples of the sewage were taken from a manhole on the trunk sewer just above the receiving basin of the pumping plant; of the sewage just before entering the settling tanks; of the combined effluent from the settling tanks and of the final effluent from a secondary contact bed. The results of these analyses as well as the results obtained in 1908 will be found in the appended table.

In discussing the significance of sewage works analyses it is necessary to bear in mind the extremely varying character of the composition of sewage, not only from day to day, but more particularly from hour to hour. Therefore it is impossible to more than point out in a general way, the meaning of the results obtained from the samples taken at the time of the inspection.

The number of bacteria in the sample of crude sewage is very low, even for a cold weather sewage, when compared with other American sewages. This is possibly due to the inhibitory effect of the chemical wastes from the tannery. The slightly larger number of bacteria in the effluent from the receiving well has no particular significance, as such a sample would correspond to an influent at about 6 a. m. and the number found would agree closely with the number found in normal sewages at the same hour, before there would be any appreciable effect of trade wastes. The effluent from the settling tanks corresponds with the crude sewage flow of about the same hour on the previous day, and assuming that the sewage on the previous day had approximately the same bacterial content, as on the day the sample actually was taken, it will be seen that there was a slight increase in going through the settling tanks. This is often the case in settling tanks, probably due to the seeding of the tanks with a particular type of organisms, adapted to the particular conditions found in the tanks. In this instance, the loss of the germicidal action of the chemical wastes, may be brought about by deposition or by union with organic substances, thereby giving opportunity for greater bacterial activity. The number of bacteria in the sample of final effluent is as low as might be expected of a well-operating plant. In this case the small number may be due simply to the inhibitory effect of the chemical wastes, rather than to the action of the contact beds.

The figures for dissolved oxygen indicate that its absorption by the sewage takes place most rapidly in the receiving well, and this fact agrees in general with the theories regarding the absorption of dissolved oxygen in sewage. As would be expected at this time of year, there is no complete exhaustion of dissolved oxygen in the settling tanks, due to the fact that cold prevents rapid decomposition of sewage. The failure of the contact beds to increase the amount of dissolved oxygen indicates an insufficient supply of air, due probably to loss of voids by clogging, accumulations of carbon dioxide, and to the rapid using up of oxygen by the deposited organic matter. A contact bed working normally at this time of year, should give an effluent with 3 to 4 parts per million of dissolved oxygen.

The results of the test for putrescibility of the final effluent, is also unsatisfactory. A well-oxidized, stable effluent should not remove the color in the methylene blue test, in less than 4 days, and the fact that this particular sample removed the color in one and a half days indicates the presence of considerable putrefactive organic matter. But, as noted before, it is impossible to base any sweeping conclusions in respect to the operation of the plant upon a single series of analyses.

On the whole, however, it will be seen that the results obtained at the present inspection are somewhat better than those obtained in 1908. This is probably due to the more uniform rate at which the plant is operated, preventing the overloading of the contact beds during the day time. While there was some odor of decomposition, resembling hydrogen sulphide around the plant, this odor was not enough to be considered as constituting a nuisance. Apparently this odor came largely from the accumulations of scum and sludge on the primary contact beds, rather than from the sewage itself.

During the investigation, Kayaderosseras creek was inspected and it was found that at the time no marked conditions of local nuisances were apparent near the outlet of the disposal plant. The effluent was dark in appearance and had a slight odor but the discoloration due to its discharge into the waters of the creek disappeared a short distance below the outlet.

Since such a large percentage of the village sewage consists of wastes from the tannery of the American Hide and Leather Company, the efficiency of the village plant depends to a considerable extent upon the character of these wastes and upon the preliminary treatment which is being given them at the tannery. A very comprehensive discussion of the different processes of tanning is given in the report upon the inspection of 1908. It will be sufficient, therefore, at the present time to refer to the above mentioned report and to describe in detail only those features which have been modified since that time.

About 1,460 sides, i e., about 730 whole hides are tanned per day. The chrome rapid acid method of tanning has been introduced to a considerable extent in the plant and at present about 50 per cent. or more of the hides are treated by this process. The process consists fundamentally in precipitating an insoluble chromium hydroxide or oxide on the fibers of a skin which has been impregnated with a soluble chromium salt. Common salt, sulphuric acid and Martin and Davis Tanolin are used. The latter is a patented chemical compound in the form of dark green crystals. After tanning the skins are put in a solution of sodium bicarbonate and water. From a study of the chemical formulae descriptive of this process it would seem that the acid constituent of the wastes is probably considerably increased since 1908 because an increase in this process would not entail a decrease in the acid used in other processes. The wastes are treated at the tannery by processes of screening and settling alone which has little effect upon the chemicals in solution.

The water supply of the tannery is derived mainly by pumping from wells and a branch of Kayaderosseras creek and partially from the village public supply. It would total between 350,000 and 400,000 gallons per day as far as could be determined at the tannery. Wastes from the dehairing machines and lime washing machines pass through a series of 5 tanks, 8 feet by 5 feet by 5 feet deep. Two of these tanks are cleaned daily. These wastes thence pass to a receiving basin, to which also come the wastes from the soaking vats, beam house and yard. A belt bucket conveyor raises the wastes into a cylindrical tank which overflows into a second cylindrical tank. A hole in the bottom of the second tank allows the wastes to flow into a trough which carries them to the first compartment of a settling tank having 4 compartments. At the time of the first inspection the wastes coming to the circular tanks were apparently in excess of the capacity of the tanks for an overflow occurred between the first and second. A foamy white scum appeared on the tanks and on the secondary series of 4 tanks and there was apparently considerable sludge in the tanks.

The wastes from the tanning material presses first pass through a narrow riffle box and thence into a settling tank. This latter tank has been damaged by building processes and at present has little value as a settling tank. It is located in a hollow in such a way that at present surface water can wash into it and the inspector was informed that roof leaders also discharge into this part of the system. The wastes thence pass to a settling tank baffled at frequent intervals and having two bar screens near the end. Considerable sludge was found in this latter tank especially near the end. Two removable baskets are placed in manholes to retain the larger solids in the wastes from the acid tanning building.

All the wastes of the tannery except from the leather board works pass through a final settling tank located on the bank of Gordon creek down the opposite bank of which a village trunk sewer passes. A removable wire basket is so located in the settling tank that the wastes discharge into it, thence passing through a perforated wall and screen into the outlet. The basket is made of about one-fourth inch mesh screening, cylindrical in shape, about 3 feet in diameter and 4 feet deep with a round hole in the side near the top. The hole is fitted over the inlet pipe and the wastes therefore pass through the basket. This tank is cleaned every 12 or 16 days and the basket replaced every other day, the inspector was informed.

At the time of the second visit a sample of the effluent of this final settling tank showed the presence of considerable suspended matter of a dark red color. The scum in the tank contained quantities of matted hair which was also found in the scum after the wastes had passed the wall and screens but were not observed in the effluent. A considerable percentage of suspended solids in the effluent quickly settled out when allowed to stand in the bottle in which it was collected.

In conclusion it may be said that in regard to the village disposal plant the problem is one of considerable difficulty. The present inspection, however, has shown improvement in the operation of the plant, although the data obtained indicate that a satisfactory stable effluent is not being produced. This may be due to the clogging of the contact beds and were these beds cleaned, a marked improvement in the quality of the effluent would undoubtedly take place. The fact that the designed capacity of the plant, 1,000,000 gallons per day, is probably reached at present, shows that the plant is working right up to capacity and with clogged beds a rather poor effluent must be expected. The practice of filling the contact beds to above the tops may account for the accumulation of sludge on their surface, and it would seem as though this accumulation could be largely prevented by the thorough cleaning of the beds, thus giving the beds sufficient capacity to receive their normal dose without having to flood the surface.

On account of the extreme care required to obtain satisfactory results from the operation of sewage disposal plants and as the control of such operation depends upon a thorough knowledge of the principles of sewage treatment, it might be well for the village authorities to consider the retaining of a competent expert to make periodic inspections and analyses. The need of such an expert is all the more acute in the present case on account of the large proportion of tannery wastes in the sewage which makes its adequate treatment a difficult problem. An expert could best determine the proper method of operation of the plant and could advise on such changes or improvements as might be found necessary.

BALLSTON SPA DISPOSAL PLANT

Results of Analyses of Samples of Sewage Before, During and After Treatment in Plant

SOURCE OF SAMPLE	TIME OF COLLECTION		BACTERIA PER C.C.		DISSOLVED OXYGEN (PARTS PER MILLION)		PUTRESCIBILITY (METHYLENE BLUE)			
	Feb. 12, 1908	Jan. 5, 1914	Feb. 12, 1908	Jan. 5, 1914	Feb. 12, 1908	Jan. 5, 1914	20°C. Feb. 12, 1908	20°C. Jan. 5, 1914	37°C. Feb. 12, 1908	37°C. Jan. 5, 1914
Influent to receiving basin	2:15 P. M.	12:50 P. M.	930,000	470,000	1.63	3.85	....	....	....	....
Effluent to receiving basin	2:30 P. M.	11:45 A. M.	5,600,000	500,000	2.13	1.94	....	....	....	....
Effluent of septic tank	3:15 P. M.	....	29,700,000	....	2.45	....	....	....	....	....
Combined effluents of coke filter before entrance to contact bed	....	10:25 A. M.	....	800,000	....	1.29	....	....	....	....
Final effluent	3:30 P. M.	10:45 A. M.	10,600,000	220,000	.69	1.23	24 hrs.	36 hrs.	24 hrs.	broken

At the tannery of the American Hide and Leather Company the inspection would indicate that the methods of screening and settling used allow a considerable percentage of suspended solids to remain in the wastes. This lack of efficient sedimentation and removal of suspended matters may be due in part to the inadequacy of design and operation of the settling tanks and in part to the interference with the proper operation of the settling tanks resulting from the admission of storm or surface water. Steps should at once be taken to improve the condition and efficiency of the works for the sedimentation of these solids and to prevent the admission of surface run-off and roof water. It is probable that the character of the wastes, due to the increased use of acid tanning process, has been materially changed since 1908.

I would therefore recommend that:

1. The village authorities be advised of the necessity of cleaning the contact beds.
2. That the practice of discharging the settling tank effluent onto land as is now done during cleaning of the coke filter be discontinued unless additional precautions are taken against any contamination of the creek by the construction of suitable filter beds on which to discharge the settling tank effluent for short periods when the coke is being cleaned.
3. That the vertical pipes in the corners of the contact beds, formerly used as gauge pipes, be removed or else replaced with longer pipes which shall reach well above the maximum height of effluent in the beds.
4. The American Hide and Leather Company be required by the village authorities to effect a permanent reduction of the suspended solids in the wastes discharged from their plant into the village sewer system.
5. That the village authorities retain a competent expert in sewage disposal to make periodic inspections and analyses in order that the best methods of operation may be determined and satisfactory results obtained.

ALBANY, N. Y., *January* 24, 1914

Copies of this report were enclosed in letters addressed to the village attorney and to the local board of health on February 5, 1914, urging that the recommendations of the report be carried out.

BRIARCLIFF MANOR

An investigation of the present conditions of operation of the sewer system and sewage disposal plant of the village owned and operated by the Briarcliff Realty Co. was made by Mr. H. B. Cleveland, principal assistant engineer of this Department on January 2, 1914. This investigation was deemed advisable following a request for advice from the board of health of the village of North Tarrytown with reference to possible pollution of the water supply which is furnished by the Consolidated Water Company of suburban New York to North Tarrytown, as well as to the villages of Hastings-on-Hudson, Dobbs Ferry and Ardsley, and the town of Scarsdale.

The communication from the board of health of the village of North Tarrytown was accompanied by a copy of a report on an analysis of a sample of water from the outlet of the reservoir (presumably Pocantico lake) and an investigation of the watershed of the lake made to the board of trustees of the village by Robert W. Hunt and Co., engineers of Chicago, Ill., under date of December 15, 1913.

This report after referring to possible sources of contamination of Pocantico river by drainage from farm houses, barns, cattle pens and other sources on the watershed above the lake, discusses the sewerage system of Briarcliff Manor, (this village lying on the watershed of Pocantico river a short distance above Pocantico lake) and after describing the settling tank and pumping station, states that " the whole territory in the vicinity of the Saw Mill river road crossing was examined for evidence of a filter bed, but without success". The report then refers to manhole "located at the side of the railroad track about 400 feet north of the Saw Mill River Road crossing where there was found a stream of water, * * * coming up from the ground beside the manhole on the south side". It is further stated in the report that a certain test with coloring matter was made "proving that this 'spring' was the outlet of the Briarcliff sewer."

As a matter of fact the disposal field on which is treated the sewage from the village of Briarcliff was found to be in successful operation at the time of the recent inspection on January 2, and it was found also that no sewage was issuing from the manhole about 400 feet north of the Saw Mill River road crossing. It was learned from Mr. H. B. Valentine, engineer for the Briarcliff Realty Co. that this manhole was on a sewer line which has never been used as a sewer outlet but which was constructed by the Briarcliff Realty Co. at the time of the installation of the sewer system for use as an outlet sewer. Quicksand was encountered during construction and one of the manholes and a considerable length of sewer pipe settled in the quicksand, necessitating an abandonment of this outlet. A careful inspection of the stream in the vicinity of the disposal field and the Saw Mill River road crossing was made and no evidence was found of the discharge into the stream at any point of sewage or sewage effluent. In explanation of the above it may be stated that the effluent from the septic tank situated about 3,000 feet above the disposal field and the Saw Mill River road crossing after reaching the adjacent pump well is pumped through a force main onto a filter bed located on a knoll having an elevation of about 30 feet above the river and situated near Buckhouts Corners some 500 feet east of the Pocantico river and 250 feet from the swamp through which the river flows.

This disposal field was fully described in a report on the system of sewers and sewage disposal of the village of Briarcliff Manor submitted to Commissioner Porter on March 5, 1913. At the time of the recent inspection the discharge of sewage effluent through the force main was taking place, filling the two main trenches and one of the 8 lateral trenches was being used for overflow from the second main distributing trench. It was apparent from the condition of the lateral trenches that only one other lateral trench had been in use during the past 3 or 4 weeks and while the method of sewage disposal in use is not based on modern practice regarding rates of operation and other features of design, the filter was operating successfully with no apparent opportunity for contamination of the Pocantico river or the creation of a nuisance at the site of the filter bed.

It is very desirable, however, that the recommendations contained in the report on sewerage conditions in Briarcliff Manor dated March 5, 1913 referred to above concerning the taking over by the village of Briarcliff of the public sewer system and the preparation and submission to this Department of plans for a comprehensive and permanent system of sewerage and sewage disposal should be followed out, the more so since no plans have ever been approved by this Department for the system of sewers and sewage disposal in use at Briarcliff Manor.

Concerning now the other questions affecting the water supply derived from Pocantico river, reference should be made to the roport on an investigation of this supply made by you to Commissioner Porter under date of October 3, 1910, and at that time transmitted to the Consolidated Water Company of suburban New York and to the local boards of health of North Tarrytown and other municipalities interested. This report describes the general conditions of the public water supply furnished by the Consolidated Water Company of suburban New York and the following conclusions, reached as a result of the investigation then made, are here repeated:

"1. That the filter plant, as shown by analyses made at various times by the State Hygienic Laboratory, is not giving good results and that its efficiency is low.

2. That this low efficiency is undoubtedly due in part to the high rate of filtration which at times is probably double the normal rate for a mechanical filter.

3. That owing to the somewhat uncertain performance of mechanical filters due to the inherent defects in their construction and operation it is important to remove the several sources of pollution now existing on the watershed of the reservoir."

This report recommended that the water company be urged to consider the feasibility of increasing the filtering area with a view to lowering the rates of filtration and thus improving the efficiency of the filters, that they take steps to prevent the pollution of the streams entering the Pocantico reservoir and, finally that if the water company should experience any difficulty in abating the insanitary conditions affecting the water supply, and further, in view of the uncertain elements attending the operation of pressure filters, they should apply to this Department for the enactment of rules and regulations for the protection of the watershed.

It is becoming more and more important that the recommendations contained in the report above referred to be carried out. Not only should the filter plant be extended and placed in proper operating condition but rules and regulations for the protection of the water supply from contamination should be enacted in order that the insanitary conditions on the Magee and Sutterly farms and at other points referred to in the report recently made to the board of trustees of North Tarrytown as well as other nuisances which may exist at other points may be corrected.

The proper procedure to prevent contamination of the stream and possible infection of the public water supply is to follow out the provisions of sections 70, 71, 72 and 73 of the Public Health Law which provide for the enactment of rules and regulations covering conditions on watersheds from which public water supplies are derived. With the enactment of such rules and regulations, all conditions that are in and of themselves nuisances as well as any conditions prejudicial to the quality of the water supply but which must be made the subject of condemnation proceedings may be abated.

It would seem, since the water company has heretofore failed to apply for the enactment of such rules after the advisability of such procedure had been brought to their attention, that the authorities of North Tarrytown and other municipalities furnished with this water supply should require the water company, under the terms of any existing franchises or agreements issued to the company by such municipalities, to make application to this Department for the enactment of rules and regulations protecting the supply and following the enactment of such rules to abate all insanitary conditions on the watershed and place the filter plant in proper operating condition.

I would recommend that copies of this report be transmitted to the board of health of the village of North Tarrytown, to the water company and to the board of health of the village of Briarcliff Manor with the recommendation that the various steps discussed above be carried out.

ALBANY, N. Y., *January* 6, 1914

Copies of this report were transmitted to the Consolidated Water Company of surburban New York, to the village president of Briarcliff Manor and to the village of North Tarrytown on January 7, 1914.

CAMDEN

An inspection of the sewerage conditions in the incorporated village of Camden, Oneida county, was made on June 4, 1914, by C. A. Howland, inspecting engineer.

Camden is located about 18 miles northwest of Rome on the west branch of Fish creek, a stream flowing into Oneida lake. It is a station on the St. Lawrence branch of the New York Central R. R. and a terminal of the Elmira and Cortland branch of the Lehigh Valley R. R. Mad river joins Fish creek just below Camden and the village is located mainly upon an elevated wedge shaped plateau between the two streams.

Census returns indicate an increase in the population of the village up to 1902, when it was 2,482, but a decrease of about 12.5 per cent. since that time, the present number being 2,170. The village owns the water supply, which is obtained from a brook and two springs. Water rents are received from about 500 taps, indicating that a large percentage of the village uses the public water supply. From the annual reports of the board of water commissioners it was found that the last of the water bonds will probably have been retired in 1915 and that the cash surplus on hand is increasing yearly. Modern improvements such as electric lights and cement sidewalks have been installed in the village. A number of factories producing furniture, knitted goods, water wheels etc. are located there.

The records of this Department show that plans for a sewerage system were approved on February 8, 1893. The plans covered the whole village as at that time built up and also a number of proposed streets. It was found during this inspection that none of these sewers had been built.

About 210 flush closets have been installed in the village and the sewage from them is disposed of by one of two general methods. Either the sewage is discharged into a cesspool or abandoned well or it is discharged into a nearby watercourse. The soil of the plateau on which the village stands is sand and gravel and it appears that the cesspools successfully dispose of the sewage. In the business section, wells were previously located in the cellars of the buildings. The inspector saw one of these in a store where foodstuffs are sold which is now used to receive the waste waters from the place. A number of wells about the village and at least one spring are still used although the extensive pollution of the ground water is a well-known fact.

Penfield pond from which ice is cut is formed by the damming of Fish creek. The business places on the west side of Main street discharge sewage directly into this pond. In the abutments of the Mexico street bridge across Fish creek a number of sewers have their outlets. Several of these are storm sewers which receive the runoff from short lengths of street, but others of them discharge fecal matter. A ditch which receives the sewage from a number of buildings on the west side of the creek near Mexico street has been the cause of complaint as was also another ditch in this part of the village. Others of the houses and factories are said to discharge into Fish creek at different points and into raceways which empty into the creek. The inspector was also informed that several manufacturing plants, a hotel and one residence, near the Main street bridge, dispose of their sewage into Mad river.

Those of the residents who have no flush closets use outside privies. In the rear of the stores on the east side of Main street, the inspector saw a privy in a filthy condition. The fecal matter from this privy was exposed on the ground within 30 feet of the rear windows of an ice cream store. Another privy in a dilapidated condition stands within 20 feet of a bakery and a smoke house, while the manure pile of a nearby stable provides a convenient breeding place for flies. A number of other places were found about the village where human excreta lay exposed on the ground. The privies of the Canamp chair factory are situated over an old raceway, and the inspector observed others set over other raceways and also over the streams. It was stated that under certain atmospheric conditions, the foul odor arising from the privies is apparent on the streets of the village.

With but one or two minor exceptions no provision has been made for carrying off the storm water from the streets. Consequently when it rains the water collects in the low places where it becomes stagnant. On the east side of Main street, surface water had created objectionable conditions by seeping into the cellar of a store.

From the above inspection it appears that while the village of Camden is favorably situated with reference to drainage and is provided with a number of modern facilities yet the health of the community is endangered and public nuisances constantly arise because of the lack of proper sewers to safely and quickly remove the sewage of the village.

Two of the principal benefits derived from a sewerage system are the protection of the public health and the elimination of nuisances. There is a very real danger of an epidemic of disease originating in infection brought to the stores by flies which breed in the manure of nearby stables and gather disease bacteria in the exposed privies. To improve the privies would afford only doubtful security since the almost universally filthy condition of such semipublic privies is an irrefutable argument against the permanency of such improvements. A general inspection of privies in the village carried out by the village authorities showed the need of better facilities among the private residences. It would be better to provide means of eliminating the privies entirely.

The privy can be eliminated by installing flush closets which is being done in the village. Here, however, another serious problem presents itself. The sewage resulting from the flush closets must be disposed of. The above inspection shows how this is being done in the village. Wells, which are still used are endangered by the constant pollution of the ground water. Many nuisances have arisen from the discharge of sewage into ditches and into water courses which in times of low water have too little volume to properly dispose of the sewage. The village has had a long experience with typhoid fever which should make the people hesitate to expose themselves to further epidemics.

The village of Camden is fortunate in that there is no problem of including in a proposed sewerage system inadequate sewers poorly constructed by individuals. Much of the trouble resulting from such poor sewer construction can be avoided by the installation of a comprehensive system adequate to care for all future needs. There is also an obvious need of storm water sewers to carry off the surface water from the streets.

Aside from the obvious need of a sewerage system and disposal plant it appears that the village will soon have available funds adequate to warrant a bond issue for such construction. I would, therefore, recommend that the authorities of the village of Camden be informed of the facts brought out by this inspection and that they be advised to take up for immediate consideration the proposition of installing a sewerage system and disposal plant.

The plans approved in 1893 apparently make no provisions for a sewage disposal works. The inspector was informed that the village has built up in parts for which no sewers are provided on the 1893 plans and has not built up in sections where sewers were provided. It is, therefore, doubtful that the plans would be adequate for the present needs. I would recommend that a competent engineer be employed by the village to study the problem of sewerage and sewage disposal and to prepare plans to be submitted to this Department for approval. While the Village Law requires that plans for sewerage for the village shall be comprehensive and cover all portions of the village this does not mean that the entire system must be constructed at once. Application can be made for permission to omit from construction those parts of the sewer system which are at present unnecessary at the same time that application is made for approval of the plans.

I would therefore suggest that copies of this report be transmitted to B. H. Stone and to the local board of health.

ALBANY, N. Y., *June* 11, 1914

Copies of this report were inclosed in letters addressed to the local board of health and to Mr. R. H. Stone on June 24, 1914, urging that steps be taken to carry out the recommendations contained in the report.

CATTARAUGUS

An inspection in regard to sewerage conditions in the incorporated village of Cattaraugus, Cattaraugus county, made on June 12, 1914, by C. A. Howland, inspecting engineer, in company with George McIntosh, M. D., village health officer. The inspector investigated a number of instances of insanitary conditions arising from inadequate sewerage facilities and later also accompanied by A. G. Setter and H. W. True, members of the Board of Trustees, made a more general inspection of conditions in the village.

The records of this Department show that on September 19, 1912, an investigation of the discharge of sewage into a stream tributary to Cattaraugus creek from a sewer in the village of Cattaraugus was made by a representative of this Department. Application was made on October 18, 1912, by the Board of Trustees to extend the so-called Waverly outfall sewer. Besides the usual revocation and modification clauses the permit issued on December 9, 1912, in connection with the approval of this plan contains the condition:

"That on or before December 1, 1914, the village authorities shall have prepared and shall submit to this Department for approval plans showing a complete general system of sanitary sewers and sewage disposal works for the village."

The village of Cattaraugus is situated in the northwestern part of Cattaraugus county upon the Alleghany division of the Erie railroad. A large part of the corporation lies upon the steep slopes of the western side of the valley of the south branch of Cattaraugus creek. A tributary of this branch passes through a deep ravine which divides the village. The census of 1910 gives the population of the village as 1,165, showing a decrease of 217 since 1900. A public water supply derived from springs is installed in the village and other facilities such as electric light and natural gas are available.

No comprehensive system of sewerage has been built in Cattaraugus. The rapid concentration of rain water due to the steepness of many of the streets has made storm water sewers necessary. Several of these have been installed by the village and as unfortunately sometimes happens in municipalities where a public water supply is available but where no sanitary sewers have been installed, house connections have been very improperly made with the storm water sewers. In the southern part of the village the ground surface is steep, rising to a considerable height to the west. The runoff from this mountainside and the flow of springs passes through the village.

It was estimated that about fifty per cent. of the houses in Cattaraugus have flush closets, a percentage which is increasing. The sewage from these flush closets is discharged into cesspools, into the storm sewers or into nearby ravines of which there are many available. The inspector was informed that the soil of the region is partially hardpan and partially gravelly material. When the cesspools are located in hardpan as in the case of those on South Main street, they fill up and overflow, making it necessary to provide an outlet for the overflow or to empty the cesspools frequently. The Berger cesspool was connected with an open ditch near some church property. This resulted in a nuisance and the overflow pipe was taken out and the sewage at present discharges on the ground. Other cesspools it was stated have been provided with outlet pipes which discharge into ravines.

The principal sewer is the one laid in Waverly street. This sewer receives not only considerable storm water but also the fecal wastes from a number of buildings including the hotel. The outfall pipe of this sewer has been extended practically as shown on a plan received November 5, 1912, for which a conditional permit was issued by this Department as noted above. Marked evidences of the discharge of fecal matter through this sewer were found near its outlet.

Between Waverly and First streets three houses are connected with a cesspool which discharges into a ravine just east of South street. Two tile pipes, one for sink and cellar drainage and the other the cesspool overflow, discharge at this point. A long iron rod is kept at this place to loosen material which clogs the pipes. A tile pipe from a house discharges fecal matter into the ravine just below this point.

Two large tile pipes, 18 and 20 inches in diameter respectively, and a house drain discharge into a ditch which runs east parallel to and just south of First street. Complaints have been received in regard to the odor arising from the wastes discharged from these pipes. The flow in this ditch is also carried under South street into a ravine.

Near the corner of Lincoln street a tile pipe and wooden sluice-way discharge into a ravine east of South street. The inspector was informed that surface water discharges from the pipe and sewage from the sluice. Privies are set over the bank of the ravine.

Mr. McDonald who lives near the corner of South and Scott streets has complained about the discharge of a tile pipe near his house. The overflow of a spring west of South street enters a ditch which discharges through this pipe. The inspector was not able to find that fecal wastes discharge directly into this ditch but there is opportunity for wash from a chicken yard and other surface wash to enter it. Mr. McDonald claims that house wastes are discharged through this ditch. The bottom of the ditch near the end of the outlet was covered with black muck.

The overflow from an ice pond in the southeastern part of the village passes through a ditch which parallels South street to a point beyond Lincoln street. The many ravines in the southern part of the village mentioned in this report, all converge east of South street and flow into a stream which is tributary to the south branch of Cattaraugus creek. This part of the village is cut up by deep ravines into most of which sewage discharges. These sewer outlets are in a majority of instances within 200 feet of the houses on South street.

North of the Erie Depot on the railroad land a large tile pipe discharges sewage and other wastes close to the rear of a residence. The inspector was informed that sewage from two factories one of which has a settling tank, from the depot, grist mill, creamery and probably other closets, discharges through this pipe.

A cesspool in the rear of a printing office is said to be the cause of water in the cellar of a nearby bakery. The discharge of sewage into this cesspool has been discontinued. The septic tank of the bakery, put in about 3 years ago, is close to the rear wall of the cellar. Similar conditions have not apparently been created in other sections of the village, which is probably due to the fact that the character of the soil is such that cesspools take care of the wastes from the individual houses and also because in a number of instances the houses can discharge directly into a watercourse without crossing the property of other persons.

The data gathered during the above inspection shows that in the village of Cattaraugus a large amount of sewage from flush closets, etc., is being discharged in such a manner that the health of the community is endangered and public nuisances are constantly arising. There is apparently a tendency among many of the people to remedy the situation by extending the present sewers (as in the case of the Waverly street sewer) to a point where the odors of the decomposing fecal wastes will not affect the residents at the time of the extension. This procedure has apparently now been gone through twice with the Waverly street sewer.

To extend all of the sewers, which now discharge in such a manner as to create nuisances to points where the discharge of sewage would not affect residents and to carry out the necessary reconstruction entailed by such extension would involve a large expenditure which might better be directed toward the proper construction of sewers properly designed and built so as to care for the sewage from the entire village in a sanitary and healthful manner. Many of the people in the village have already spent money to obtain results in the disposition of sewage which are in no way permanent and which in many cases, have not even given temporary satisfaction. This unnecessary expense would be saved to those who have not yet installed flush closets and a permanent and satisfactory solution of the problem of disposing of sewage would be secured for those who already have flush closets if a general system of sewers were constructed in conformity to a proper plan.

It is argued that the health of the community is good and that few complaints are made. The first argument is of course untenable since it is the condition of all communities before an epidemic of disease, a condition only to be maintained by careful prevention and safeguards. In regard to the latter, the inspector heard of as many as six complaints, some of which were repeated to him personally and it is not probable that the number will decrease or the cause for complaint be removed without general action on the part of the village in the matter of a general sewer system.

Therefore, the need of a system of sewerage for the village of Cattaraugus is made very evident. The inspector was informed that no steps have yet been taken by the village authorities toward the preparation of plans for sanitary sewers and sewage disposal works to be submitted to this Department for approval. It is apparent that in order to relieve the present conditions in a permanent manner and also to comply with the conditions of the permit issued December 9, 1912, this work should be undertaken at as early a date as possible.

I would, therefore, recommend that the village authorities be informed of the results of this inspection and that they be advised to immediately employ a competent engineer to prepare plans for a comprehensive system of sewerage and sewage disposal works for the village of Cattaraugus.

ALBANY, N. Y., *June* 18, 1914

A copy of this report was inclosed in a letter addressed to the local board of health on June 24, 1914, urging that the recommendations contained in the report be carried out.

CHEEKTOWAGA (town)

An inspection of the insanitary conditions in the town of Cheektowaga near the city of Buffalo was made on June 11, 1914, by C. A. Howland, inpecting engineer, in company with Wm. H. Baker, M. D., health officer of the town of Cheektowaga.

A part of the town of Cheektowaga known as the Pine Hill section is in reality a contiguous part of the city of Buffalo. It is principally a residence section composed of one and two story detached frame houses. Business blocks are located on Genesee street, an extended Buffalo city street. The public water supply is furnished by the Western New York Water Company but no system of sewers has been built in the section. In the general inspection made of the territory it would appear that there are not a large number of houses which have flush closets although they have been installed in some of them. The majority of the houses have privies. Since there are no sewers the wastes from houses and the water flowing from wells and springs is discharged through surface ditches. There are also a few cesspools although only one of these could be definitely located.

A ditch passes through the yards between Avery and Olcott streets in the rear of the houses. The gutters in the streets are also used to receive waste water. The privies in some instances are set directly over a ditch or so located that fecal matter would wash into the ditch. Manure from stables and chicken yards finds its way into the ditches, as does refuse and garbage. The beds of the ditches were mainly composed of black muck which had a foul odor. There is apparently a continous flow through them although the grade is not steep.

The property owned by the heirs of P. Winspear adjoins the Pine Hill section on the south. A ditch along the north side of this property serves as an interceptor for the Pine Hill ditches, which discharge into it. At the northwest corner of the Winspear lot the ditch turns and extends south close to the city boundary line. The black muck covering the bottom of this ditch with the gas bubbles and the characteristic odor indicated the active decomposition of organic matter.

Previously a tile pipe connected this ditch with a sewer in Humason avenue, in the city of Buffalo. At the time of the present inspection the flow through this pipe connection was obstructed so that the wastes spread out over the Windspear property. An area equal to probably 1½ acres was flooded. Residents of Humason avenue when interviewed by the inspector stated that odors arising from this flooded area constitute a nuisance at their houses and it also appeared that water had been found in at least one cellar. Humason avenue runs north and south just of the Winspear property and the lots on the east side of the street, therefore, extend back to the flooded area.

The inspector interviewed Captain George H. Norton, Deputy Commissioner of Public Works of Buffalo, from whom it was learned that the disposition of drainage from the Pine Hill section adjacent to Buffalo has been under consideration by the city officials. Maps and profiles which were shown the engineer and other information seemed to indicate that the backing up of sewage in the Humason avenue sewers had in the past been produced by back water through a storm water overflow valve of flood water from Soajaguada creek. It is the intention of the city authorities to inclose and otherwise improve Soajaguada creek at which time proper disposition will be made of the drainage of the vicinity and also of the Pine Hill section. Although bids have been received construction work has not as yet been started.

In view of the above inspection it appears that there is, tributary to the Buffalo sewer system, an extensive area in which no sewers have been provided. A topographical survey conducted by the city and the results of the present inspection indicate that the sewage from this section will be finally disposed of in the sewer system of Buffalo.

It is not probable that such disposition of the sewage can be made immediately. There is, however, a very pressing need of sewers in the Pine Hill section. As now disposed of the surface drainage and sewage from this area, stagnating as it does in the rear of the houses on Humason avenue, gives rise to a public nuisance and creates insanitary conditions. The drainage of this area into Humason avenue sewer will afford only a temporary relief.

I would therefore recommend that the citizens of the Pine Hill section of the town of Cheektowaga be advised to form a sewer district as provided by the Town Law. A competent engineer should be employed to prepare comprehensive plans for a sewer system for this section and these plans should be submitted to this Department for approval as provided by the Public Health Law.

ALBANY, N. Y., *June* 19, 1914

A copy of this report was transmitted to the local board of health on June 27, 1914.

ELLICOTTVILLE

An investigation in regard to sewerage conditions in the incorporated village of Ellicottville, Cattaraugus county, was made on August 28, 1914, by Mr. C. A. Howland, assistant engineer in this Department, as a result of complaints received by this Department in regard to the pollution of Great Valley creek by sewage from the village.

In connection with the inspection of an outbreak of typhoid fever in December, 1913, an inspection was made of existing sewerage conditions in the village of Ellicottville. In the report upon that investigation, it was recommended that " the village should take up immediately the question of installing a proper sewerage system and sewage disposal plant, the need for which is obvious. It cannot be said that the village is properly protected until this has been done."

Ellicottville is located in the central part of Cattaraugus county on the Buffalo, Rochester and Pittsburg R. R. about 50 miles south of the city of Buffalo. The population according to the census of 1910 is 985, a slight decrease from that of 1905. The village is provided with a public water supply, electric light and other modern facilities but has no comprehensive sewer system. The Great Valley creek basin in which the village lies is flat in this part and the subsoil consists of gravel to a considerable depth underlain with hard pan and substrata of a gravelly nature. The inspector was informed that in the spring and at times of heavy rainfall the ground water rises in cellars and wells close to the ground surface.

A 15-inch sewer has been laid in the village to take care of the sewage, and roof water from the business blocks on Main street and from a number of residences, two hotels and the public school. This sewer was laid in 1907 by private individuals to replace an older sewer consisting of wooden logs.

Exclusive of the school which has about 240 pupils, 150 persons contribute sewage to the sewer. A total of 390 persons are, therefore, contributing to this sewer. This sewer is laid from a point just below Jefferson street, down Main street to Monroe and along Monroe to Great Valley creek just below Martha street. A branch to which are connected three residences is said to join the sewer at the corner of Martha and Monroe streets. The engineer was informed that no trouble has been experienced with clogging. Storm water inlets are not permitted in the sewer.

About 150 feet below the outlet of this sewer a smaller drain from two residences discharges behind a wooden bulk head. Brush has been filled in behind the bulk head so that the sewage discharging from this small drain is retained and gives rise to a nuisance. At the time of the inspection there was considerable flow in Great Valley creek and consequently no condition of local nuisance existed about the end of the large sewer although the evidences of the discharge of sanitary sewage were observed. It is alleged that in the times of low flow the sewage accumulates in the creek and gives rise to odors which create a nuisance at nearby residences.

In a general investigation of the stream in the village it was found that the condensary owned by the Borden Condensed Milk Co. discharges wash water and sanitary sewage and waste water from the condensing cans through a single outlet into the creek. Some four flush closets used by 25 employes are installed in the condensary. When the condensing can is being used about 800 gallons of clear water are discharged into the creek. At other times when the floors, utensils, cans, etc., are being cleaned about 100 gallons per minute are discharged.

Above the condensary are two last factories, namely the Ellicottville Milling Co. and the Fitzpatrick and Miller plant, which in the process of manufacture produce considerable quantities of saw dust and shavings. This saw dust and shavings had been piled close to the creek in such a manner that it found its way into it and was washed down the stream. In conversation with persons connected with the two last factories it was brought out that it is possible to burn a large precentage of the saw dust and shavings and that the part which cannot be immediately burned under the boilers can be piled in such a manner as not to pollute the stream.

It was alleged by persons with whom the engineer talked that fish in the creek had been killed by the low water and that the putrefaction gave rise to obnoxious odors. It was stated that odors thus created aggravated to a considerable extent the conditions of local nuisance in the creek.

As a corrective measure the village authorities recently sprinkled over the creek bed a number of barrels of unslaked lime. While this was effective for short periods it did not apparently afford a permanent relief. Steps had also been taken to clean out the accumulations of sediment in the creek and thus allow a clear channel for the carrying away of putrescent matter.

Just below the outlet of the main sewer a small stream joins Great Valley creek. The engineer followed this creek throughout its course in the village and found that a number of overflow pipes from cesspools discharged into it. These cesspools are apparently constructed with dry walls in such a manner that the sewage seeps into the gravelly soil. Trouble has been experienced with these cesspools where soapy water and greasy kitchen wastes have been discharged into them. The pores of the soil have thus been clogged up causing the cesspools to overflow. Two drains were also observed from which sewage discharged onto the bank of the creek, apparently without previous treatment thereby creating conditions of nuisances.

From the above inspection it appears that the steps which have been taken by the village of Ellicottville to provide sewerage facilities to take care of the considerable volume of sanitary sewage have not been effective. The larger sewer on Main street discharges in such a manner as to create conditions of nuisance as does also the small drain below it. It also appears that the health of the village is endangered by the discharge of drains into a small tributary of Great Valley creek. There is obviously a great need of a properly designed system of sewers. The trouble in the past has been that the sewers have been installed without regard to any comprehensive sewer plan and, therefore, without proper regard for future needs.

I would, therefore, recommend that the village employ a competent sanitary engineer to prepare plans for a comprehensive system of sewerage and a sewage disposal plant, these plans to be submitted to this Department for approval as provided by the Public Health Law. While this law requires that the plans submitted shall cover the whole village and show an adequate system of sewage disposal, this does not mean that the entire system must be installed at once. Only the more necessary portions of the system or those sewers which are at present essential to properly care for the sewage of the village need be built and application can be made at the same time that application is made for the aproval of the plans for permission to omit temporarily from construction such sewers as are not at present needed. Furthermore, the funds for the construction of the more necessary portions of a general sewer system may be provided for by the issuance of long term bonds.

It will be seen that the village can thereby proceed to rectify the existing insanitary conditions and conditions of public nuisance in such a manner that the first cost and the annual cost may be made very moderate and at the same time may provide, finally, a complete and adequate sewer system to take care of all future needs of the village.

I would finally recommend that copies of this report be submitted to the Health Officer of the village of Ellicottville for presentation to the village board and that a copy be sent to the complainant and that the village authorities be urged to take steps at once to carry out the recommendations of this report.

ALBANY, N. Y., *September* 10, 1914

Copies of this report were enclosed in letters addressed to the local board of health and to the complainant on September 12, 1914.

LYNDONVILLE

A sanitary survey of the village of Lyndonville with special reference to the water supply, sewers and sewage disposal conditions of the village at the present time was made on August 13, 1914.

Lyndonville is an incorporated village in the town of Yates, Orleans county, N. Y. It has a population of some 700. It is some 50 miles west of Rochester and is located on the Rome, Watertown and Ogdensburg Divisions of the N. Y. C. R. R.

There was considerable correspondence between this Department and the village authorities in the summer and fall of 1906, in regard to constructing in the village a party sewer discharging into Johnson creek. The records of this Department show that Mr. H. B. Cleveland of the Department examined the local conditions with reference to the approval of a plan for a sewer on Main street in said village and for a permit to discharge sewage into Johnson creek and reported his findings under date of July 31, 1906. This report said in part:

"The sewer proposed would ultimately form a part of a general system, provided its depth at the intersections of Eagle and Maple streets would be sufficient to allow connection with sewers on these streets for about one block to the eastward.

"In the absence of data on map presented relating to elevations of sewer invert and depth below ground surface, the above possibility of future usefulness is not assured, and I would recommend that the plan be returned for the addition of data noted above before approval."

The village authorities did not prepare and submit proper plans of a sewerage system as recommended by this Department and nothing further was done at that time. However, the Department was informed in 1912 that the village was preparing to install a public water supply and since that time private parties have made application to the Department for permits to discharge sewage into Johnson creek. Consequently it was deemed advisable that this Department should make a further inspection of the present conditions existing in the village of Lyndonville and Mr. C. S. Ell, Inspecting Engineer for this Department, was detailed to visit Lyndonville and on August 13, 1914 made the required investigation in accordance with your instructions.

It was found that the village of Lyndonville was incorporated in 1903, that the village now contains some 200 dwellings and business places and has a population of some 700. It maintains some 3 miles of concrete sidewalks and is lighted by electricity. Most of the buildings are in first class condition and surrounded by spacious lawns. The water supply for the village is obtained from private wells. Some are dug to depths of 10 to 20 feet and some are drilled and driven to depths of 40 to 100 feet. The toilet facilities are in most cases the ordinary privy with or without vaults. However, it was estimated that some 25 of the newer houses are equipped with modern plumbing and discharge their sewage and wastes into cesspools and septic tanks.

Lyndonville is situated on slightly rolling land. The soil is sandy loam underlaid with quick sand, clay and gravel under which is a strata of limestone. All the business places and a large number of the dwellings are located on the principal street in the village, known as Main street, and extending about due north and south. Johnson creek crosses Main street, flowing east through the center of the village and is some 75 feet wide at Main street. The only commercial industries in the village are the Lyndonville Canning Co., American Fruit Products Co., and Lyndonville Ice and Cold Storage Co., all located in the extreme northwestern part of the village. The territory surrounding the village is slightly rolling and the chief industry is fruit growing.

A few of the buildings near the bridge, crossing Johnson creek or Main street were found to discharge sewage directly into the waters of the creek. The creek is apparently used at least occasionally by a few residences as a source of water supply for flush closets and sewage and wastes are discharged into the creek. The waters of the creek are somewhat muddy and of a dirty color. The creek is very shallow and contains considerable refuse such as boxes, barrels, cans, etc. The rocks and other objects in the stream are covered with a heavy, brownish green, slimy growth.

On August 17, 1912, the village voted on the proposition of appropriating $25,000 for the installation of a public water supply and the appropriation was made. However, upon investigation it was found that no source of supply of good quality and adequate quantity could be obtained for that sum and an election was held on March 18, 1913, to rescind the former vote and apppropriate $37,000 for the purpose but the whole proposition was lost. Since no supply is readily available, there appears to be no indication of a public water supply being installed in the village in the near future.

The general topography of the village would lend itself readily to a simple, general and comprehensive sewerage system. It appears that all of the sewage of the village could be collected and conveyed to a suitable site for disposal near Johnson creek below the village.

After passing through the village Johnson Creek flows some 9 miles northeast to Lake Ontario. In this course the creek flows through the unincorporated village of Kuckville located near Lake Ontario. This place contains less than 25 dwellings. There is also a small summer resort at the point where the creek is tributary to the lake. It does not appear from records of this Department that Johnson Creek is used as a source of public water supply below the village.

It is advisable for several reasons that sewers in villages be built in accordance with a general plan. Experience has shown that the construction of private sewers has delayed indefinitely the construction of a general public sewerage system. While there is some concern now with reference to the manner of disposing of sewage in the village this will be greatly increased should a public water supply be installed prior to a sewerage system. It appears, therefore, that the time is at hand when the village authorities should take up the question of a general, comprehensive sewerage system and that plans should be prepared and submitted to this Department for approval in order that a public sewerage system may be installed at the time of or before installation of a public water supply. Such plans should provide for at least a preliminary treatment of the sewage before its discharge into Johnson Creek.

I would therefore recommend that the village authorities be informed of the advisability of employing the services of a competent sanitary engineer to prepare plans for a general sanitary sewer system and for sewage disposal for the village of Lyndonville, such plans to be submitted to this Department for approval and that they be urged to install such sewerage and sewage disposal system, at or before the installation of a public water supply.

Careful consideration has been given to the application received by this Department from the New York Telephone Company, dated August 3, 1914, for a permit to discharge into Johnson creek the effluent from a septic tank to be used to treat the sewage from their office in Lyndonville. It does not appear from the results of the investigation as detailed above that favorable consideration should be given to the application above referred to unless plans are submitted showing more complete treatment of the wastes than would be provided by the settling tank or plans were submitted to accompany the application showing a settling tank located at some point below the populated sections of the village and I would therefore recommend that the application submitted be denied and that no permit be issued unless application is made for a permit to discharge effluent from a settling tank located at some point below the built up portion of the village.

I would further recommend that copies of this report be forwarded to the board of health of the village of Lyndonville and to the Buffalo office of the New York Telephone Company.

ALBANY, N. Y., *August* 29, 1914

Copies of this report were transmitted to the local board of health and to the New York Telephone Company at Buffalo on September 9, 1914. The application for a permit to discharge effluent from a settling tank to treat the sewage from the office of the New York Telephone Company at Lyndonville into Johnson Creek was denied in accordance with the recommendation of the above report.

MONTGOMERY COUNTY TUBERCULOSIS HOSPITAL

An inspection of the sewage disposal plant of the Montgomery County Tuberculosis Hospital was made on May 1, 1914, as the result of a request from the superintendent of the institution that such inspection be made of the operation of the disposal plant at the hospital.

The institution which was opened on September 15, 1913, is located in the town of Amsterdam about four and a half miles east of the city of Amsterdam and about one half mile north of the Mohawk river. The hospital can at present accommodate twenty patients and has an average attendance of about eighteen. There are eleven employes which bring the population up to thirty. The water consumption is now estimated at about 2,500 gallons per day. It is proposed to construct a new building for employes which will give room for more patients at the hospital and probably bring the population of the institution up to fifty within the next year or two which is the estimated maximum future population of the hospital.

Plans for a sewage disposal plant for the institution consisting of a two compartment covered settling tank, dosing chamber and subsurface irrigation field divided into two portions were approved by the Department on September 17, 1912. The settling tank which is nearest to the institution is located about 275 feet south of the main hospital building and the subsurface irrigation field covers an area of about 0.4 acres south of the settling tank.

The inspection of the disposal plant showed that it had not been constructed in complete conformity with the plans. Although the settling tank and dosing chamber appeared to have been built in accordance with the plans, the discharge siphon in the dosing tank has a draft of only two or three inches as against a draft of between two and three feet usually obtained in the ordinary discharge siphon. The siphon, furthermore, did not appear to break positively but dribbled for some time after each discharge.

The most serious defect of the system, however, appeared to be in the construction of the subsurface irrigation system. The approved plans show two main distributors extending from the valve or gate chamber at an angle of about 45 degrees with the longitudinal section of the settling tank with lateral distributors running nearly parallel with the cross section of the tank or parallel with the contour of the ground which would have given the laterals a very slight slope. It is found that although the main distributors were laid as shown by the plans the laterals were laid parallel to the longitudinal section of the tank and perpendicular to the contours giving them a slope of from 2 to 4 per cent., with the result that at each discharge of the siphon, the sewage probably rushes down to the ends of the laterals with sufficient force to break through the ground near the ends of the lines causing the sewage to flow over the surface of the ground until it is absorbed by the soil.

The distributing system is laid at a depth of ten inches below the surface of the ground and the joints of the lateral tiles are protected from infiltration of soil by tar paper placed over them. The main distributing system consisting of vitrified tile pipes, is laid with open joints and the laterals simply inserted in the ends of " Y " branches of the main distributors without cemented joints. It is important that the joints of main distributors as well as the first section of each line of lateral distributors should be laid with tight joints in order to prevent this portion of the system from being disturbed by sudden rush of water at each discharge of the siphon.

The soil at the disposal plant consists of a top layer of black, clayey and sandy loam about ten inches deep with a subsurface soil of rather compact yellow clay mixed with sand, gravel and cobbles. The ground water level at the time of the inspection as indicated by the level of the water standing in test pits which had been dug when the system was installed was about one foot below the surface of the ground or about level with the top of the clay subsoil. There had been considerable rain prior to the time of the inspection so that the elevation of the ground water was probably at its maximum and is undoubtedly considerably lower during the greater portion of the year.

In conclusion I would state that it appears from the inspection of the sewage disposal plant of the hospital that it has not been properly constructed and does not operate satisfactorily. Owing to the present arrangement of the distributing system and the small dose delivered to the irrigation field, it appears that only the lower portions of one or two of the laterals of the distributing system are filled with sewage at each discharge of the siphon with a result that these lines are overdosed leaving the remainder of the irrigation field apparently out of use.

It is evident that in order to operate a subsurface irrigation system of this character successfully under the existing adverse conditions of subsoil and ground water such a system should be carefully constructed and operated. Both the main and lateral distributors should be laid with very slight slopes and each discharge of the dosing siphon should be large enough to about half fill one half of the distributing system in use at one time. The main distributor and the first pipe of each line of lateral distributors should be laid with tight joints. Even with these precautions it may be found necessary to subdivide the field into a number of small beds and underdrain the system and so extend it as to cover a greater area and provide a greater number of feet of distributing tile or it may possibly be found necessary, if the population is materially increased, to provide some other method of treatment such as intermittent sand filtration owing to the heavy nature of the soil at the disposal plant site. This, however, is a question which can be determined only after careful and detailed study, by a competent sanitary engineer, of all of the local factors involved and one which this Department cannot with its limited funds and resources attempt to determine or give detailed advice on.

I would therefore recommend that copies of this report be sent to the county and hospital authorities and that they be urged to take immediate steps to carry out the general recommendations embodied in this report. These officials should also be advised that plans for any modifications or extensions to the systems must be submitted to this Department for approval.

ALBANY, N. Y., *May* 12, 1914

A copy of this report was sent to the superintendent of the hospital on May 13, 1914.

NEW LEBANON (town)

An investigation of insanitary conditions in the town of New Lebanon, Columbia county, with special reference to the pollution of Wyomanock creek and its tributaries by sewerage and trade wastes, was made on October 27, 1914, by C. A. Howland, assistant engineer, in company with Nat. P. Brook, M. D., local health officer, at whose request the investigation was made.

The town of New Lebanon, which has a population of 1,378, according to the census of 1910, a decrease of 178 since 1900, is situated in the northeastern corner of Columbia county. Practically its entire area is part of the watershed of Kinderhook creek and its tributary, Wyomanock creek. Although the creek valley is flat along the stream, the surrounding country is rugged, rising to heights of 500 feet or more above the stream. For this reason, somewhat more than half of the population of the town is located along the valley bottom. This population may be divided roughly into three groups, which comprise the unincorporated villages of Lebanon Springs, New Lebanon and New Lebanon Center, together extending over a distance of about 4 miles. There is, of course, a considerable population scattered between them. While, in general, the population is a permanent one there are a number of places which are occupied only in the summer.

In company with Dr. Brook, the engineer investigated Wyomanock creek from Lebanon Springs to a point beyond New Lebanon Center. Reference is made to the accompanying map prepared by Dr. Brook, which shows the location of all the buildings in the town together with data regarding the sewage disposal and water supply of each place. None of the villages are provided with a public water supply system but, due to the facility with which water may be piped from springs on the mountain sides or obtained from wells, a number of the houses have modern plumbing. With the installation in the houses of flush closets, baths, kitchen sinks, etc., has arisen the problem of providing a means of disposing of the sewage from the individual places. As these places are in a majority of cases isolated there has apparently been few instances where joint or common sewers have been built, but the method has been almost universally to discharge the wastes into a nearby watercourse or where a watercourse is not available to use a cesspool. The soil of the region is said to be sufficiently porous to allow the use of cesspools, without serious trouble.

In the majority of those places which sewer into Wyomanock creek, the sewage is discharged without treatment directly into the creek or tributary. Settling tanks have, however, been built in a few instances. One of these, used in connection with a place which was closed at the time of the inspection, is said to be allowed to fill, when the entire contents are discharged into the creek. Another settling tank is said to be washed out at such times as the flow in the stream is high. Two of the sewer outlets discharge into a swampy area between the stream and the road.

Probably the largest volume of sewage from any single sewer outlet is discharged from the factory of the Tilden Company, manufacturers of pharmaceutic preparations, such as fluid extracts and tinctures. Mr. J. H. Cox, one of the principal stockholders of the company, informed the engineer that about 35 persons are employed at the plant which was established in the village of New Lebanon in 1848. It appears that the wastes from the plant, amounting to about 6,000 gallons per day, consist almost entirely of sewage from the two toilets, water used for cooling, wash basin and wastes from sinks in which bottles are washed. The wastes discharge into a stream or canal diverted from Wyomanock creek. Sewage from the Tilden and Cox residences also discharges into the same canal near the point where the factory enters it. Accumulations of toilet paper were found at this point as well as at other points where sewers discharge.

In addition to the pollution of this stream and its tributaries by sewage there is also pollution from privies which stand over the bank and in such positions that the fecal matter would be washed by storm water into the stream. As far as could be learned at the time of the inspection the water of the creek is not used for potable purposes in the town of New Lebanon or below.

From the above inspection it appears that there are in the town of New Lebanon a considerable number of buildings from which sewage is being discharged into Wyomanock creek and its tributaries and this sewage discharge is at its maximum in the summer when the flow in the creek is low. Complaints have been received by the local board of health, of nuisances due to odors and insanitary conditions arising from the discharge of sewage into this stream. Unless steps are taken to prevent the continuance of this pollution, it is evident that as additional buildings discharge their sewage into Wyomanock creek these conditions will become worse.

I would therefore recommend that the authorities of the town of New Lebanon be advised that a sewer district should be formed as provided in the Town Law and that plans should be prepared by a competent engineer for a comprehensive sewerage system to cover the whole district. These plans should be submitted to this Department for approval as provided for by the Public Health and Town Laws. I would recommend further that the town authorities be advised that in the event that such steps as outlined above are not taken immediately by the town it is the duty of the local board of health to take such action as shall cause the discontinuance of the discharge of sewage into any stream where a public nuisance is caused by such discharge and to require the disposal of this sewage on the property of the individual owners without nuisance.

ALBANY, N. Y., *November* 20, 1914

A copy of this report was transmitted to the local board of health on November 21, 1914, in accordance with the recommendations of the report.

PAWLING

An investigation of an alleged nuisance existing in a stream near the chocolate factory of P. G. Pickman & Brothers in the village of Pawling, Dutchess county, N. Y., was made on August 7, 1914. This nuisance was originally complained of to the Department on November 5, 1913, by P. G. Pickman & Brothers through their lawyers, Coudert Brothers, of New York city.

In view of the above complaint an investigation of the alleged nuisance was made by Mr. C. A. Howland, sanitary inspector for this Department, on November 28 and 29, 1913, and reported under date of December 11, 1913. Copies of this report were forwarded to the law firm of Coudert Brothers and to Dr. C. E. Buffington, health officer of Pawling, N. Y., with a letter from the Department stating in part:

> "It is apparent that the time has come when proper provision should be made for the collection and treatment of the sewage of the village before it is discharged into streams and watercourses, and I would ask you therefore to present this matter to the village Board and urge upon them the necessity of taking steps to provide an improved system of sewage disposal for the village at an early date.
>
> "The construction of such a system is the proper solution of the problem brought about by the present discharge of sewage into the streams and

> ditches of the village of Pawling and if such proper improvement is not carried out at an early date the Board should require the discontinuance of all discharge of sewage into streams in the village in order that an abatement of the nuisance now existing may be brought about."

On May 2, 1914, another complaint was filed with the Department by P. G. Pickman Brothers through their lawyers, Vogel & Vogel, of New York city, stating that nothing had been done by any authorities in the village of Pawling to abate the nuisance previously reported. Consequently the Engineering Division was ordered to make a second investigation and Mr. C. S. Ell, Inspecting Engineer for this Department, visited Pawling on August 7, 1914, and made the required investigation in accordance with your directions.

The facts and conditions as stated in the original report dated December 11, 1913, were verified and existed at the time of this investigation with the exception that some of the properties have changed hands and the Slawson-Decker Creamery Company was handling somewhat less milk than at the time of the former inspection. It was found that the sewer still discharged into the culvert under the railroad and that the P. G. Pickman and Brothers' chocolate factory had operated only a short time after its completion in the spring and had been closed most of the summer and was closed at the time of the inspection. It was stated by several residents of the village that the factory had gone into the hands of the receivers.

It was found that above the railroad culvert the stream in question was a small brook, apparently fed by springs. The water was clear and sparkling and gave no visible evidence of pollution. The cross-section of the flow at one place just above the culvert was 18" x 2½" with a surface velocity of about one foot per second. Below the culvert the brook had the appearance of an open sewer, the water had a somewhat greyish-black appearance, gave off a very foul and offensive odor characteristic of sewage and the bed of the stream was lined with toilet paper, greyish deposits and the usual growths which accompany pollution of this kind. A short distance below the culvert the stream turns and crosses under the road, here the stream has a cross-section of flow of some 2'-6" wide and 6" deep with a surface velocity of ½ foot per second showing that the brook contained as much sewage and wastes as there was water above the culvert. In the bottom of the stream at this point was a deposit of black sludge some 6" to 18" deep, giving off bubbles of offensive gas and in much larger quantities when stirred up. The deposition and consequent putrefaction of the organic matter, feces and wastes discharged into this stream creates a decided nuisance and a very objectionable condition. The stream has a fairly flat slope and is overgrown with weeds. It flows west past the Pickman factory some 200 feet from the building. It is tributary to Swamp river some 400 feet northwest of the factory. Swamp river above the brook is clear and apparently not polluted. It has a cross-section of flow of some 8' wide and 6" deep with a velocity of 1' per second. Below where the brook enters, the water has a milky appearance and there is a small amount of black sediment in the bed of the stream but no appreciable odors were noticeable. One half mile below this point there was only a slight amount of sediment but the water maintained its milky appearance. This milky appearance of the water was also just as pronounced one mile below the entrance of the brook but there were no other indications of domestic sewage.

It was ascertained that the report of the existing insanitary conditions dated December 11, 1913, and transmitted to Dr. C. E. Buffington, Health Officer, Pawling, N. Y., on December 13, 1913, had been turned over to the secretary of the board of health, but the secretary stated that he did not know whether he had ever presented it to the village board or not.

In conclusion I would state that it appears that the nuisance and insanitary conditions existing in the brook near the P. G. Pickman and Brothers' factory is as bad or worse than at the time of the previous investigation on November 28 and 29, 1913, that the same properties are discharging sewage and wastes through the same sewer into this brook. Also that the village board was urged by this Department through the local health officer.

on December 13, 1913, to take steps to provide for sewerage and sewage disposal for the village or that the local board of health require the discontinuance of all discharge of sewage into streams in the village in order to abate the nuisance then existing. It is evident further, that the village board has not taken any steps to dispose of the sewage and wastes now discharged into the stream in question and that the local board of health apparently has not taken any action to cause the abatement of the nuisance.

I would, therefore, recommend that the village authorities be again urged to follow out the recommendations contained in the previous report transmitted to them on December 13, 1913, which outlines the method of procedure in such cases. I would also recommend that a copy of the former report be sent to the village authorities.

ALBANY, N. Y., *September* 2, 1914

A copy of this report was enclosed in a letter addressed to the local board of health, urging that the recommendations contained in the report be carried out.

PORT LEYDEN

An investigation of the alleged foul and insanitary conditions existing in the Black River canal in the village of Port Leyden, Lewis county, N. Y., was made by Mr. C. S. Ell, inspecting engineer of this Department on August 29, 1914.

It was found that Port Leyden is an incorporated village with a population of some 764 according to the census of 1910. It is located some 40 miles north of Utica, on the Black river, in Lewis county, and is a station on the Rome, Watertown and Ogdensburg division of the New York Central Railroad. Black river flows northward through the central part of the corporation, but through the eastern edge of the village and is the boundary line between the town of Leyden and town of Lyonsdale, so that the village corporation is partially in each town, but the village proper is in the town of Leyden.

The Black River canal is some 45 feet wide and 6 feet deep with a depth of water at the present time of some 4½ feet and flows northward through the central part of the village proper, in the town of Leyden. It is said to enter Black river some 3 miles below the village. There is a small brook flowing from Hoyt's pond, in the northeastern part of the village eastward through the northern end of the village and emptying into a small basin through which the Black River canal has been constructed. This brook originally continued eastward some ¼ to ½ mile further to Black river before it was intercepted by the canal.

The village has a public water supply which has been installed for some 15 years but there is no village sewerage system. Ordinary dug wells are still used by some of the residents as a source of potable water. The village is situated on rolling land, the soil being clay and sandy loam. The principal street in the village is known as Main street and extends east and west crossing the Black River canal and Black river which are some ⅛ of a mile apart at this point and separated by a small ridge extending north and south. West of the canal on Main street, a storm water sewer has been constructed and discharges into the canal south of the bridge crossing the canal on the line of Main street. This sewer is alleged to carry only surface water.

East of the canal and back of the buildings on the north side of the street a 10-inch storm water sewer has been constructed, some 150 feet long, parallel to Main street, crossing Mechanic street and discharging into the canal north of the Main Street bridge. This sewer now receives the sewage and wastes from some five properties discharging the same directly into the canal. South of the Main Street bridge and on the east side of the canal was found another sewer discharging sewage and wastes into the canal.

Several other drains were located along the canal which were alleged to discharge kitchen wastes therein.

The high school building is located on Douglas street which is parallel to the canal and extends north from Main street. This school has an average attendance of some 100 students. The building is being repaired and five flush closets, one urinal and four wash basins have been installed. A 4-inch tile sewer has been constructed from the building some 430 feet east to the canal through which it is contemplated to discharge all sewage and wastes directly into the canal.

The brook in the northern part of the village receives the wastes from the creamery owned and operated by Mr. Henry Arnstein. The wastes are said to consist of waste water from washing cans, vats and utensils, floor washings, whey when cheese is made, and the toilet wastes from two closets. The sewage and wastes were alleged to create a nuisance in this brook and in the basin into which it discharges but as the whole territory had been flooded by a heavy rain the night before the inspection no nuisance could be said to exist at that time.

Mr. V. J. Sweeney, the village plumber, who has installed practically all the plumbing in the village, estimated that some 10 properties discharge sewage and some 25 properties discharge wastes directly into the canal. The only factory wastes being those from the creamery previously noted.

There is a lock at the extreme northern end of the village which maintains the level of the water in the canal through the village and as long as this is kept closed and water fed into the canal above the village, the canal is maintained full of water throughout the village. Under such circumstances it was stated by Mr. W. H. Burke, president of the village, and other residents of the village that no odors or insanitary conditions existed. This was the condition at the time of the inspection and no odors or visible evidence of pollution of the waters of the canal could be observed at the time of the inspection.

The Black River canal through the village of Port Leyden is said to be very seldom used and for the past few years has been in a state of repairs so that at such times there has been very little water in the canal. It was stated that each summer during the months of April and May the canal is practically dry as water is not fed into the canal until about June 1. It is during this period that the worst conditions obtain and at such times it is alleged that a nuisance does exist.

As far as could be ascertained Black river is not used either in the village or below this point as a source of potable water. The river now receives the sewage and wastes from a few of the village properties and is alleged to receive the raw sewage and wastes from the village of Lyons Falls and Lowville below Port Leyden.

It appears, therefore, that sewage and wastes are discharged from several properties, in the village of Port Leyden, into the Black River canal, that such discharge in some cases has existed for the past 20 years, but that the tendency to use the canal as a repository for sewage and wastes is rapidly increasing. Furthermore such discharge without a permit from the State Commissioner of Health is in direct violation of section 76 of the Public Health Law and evidently, occasionally at least, creates a public nuisance. It appears further that the village is in need of a village sewerage system to collect the sewage and wastes from the village and conduct the same to a sewage disposal plant or to a satisfactory point of discharge, such as the Black river.

I would, therefore, recommend that the attention of the village board be called to the necessity of a general system of public sewers in the village of Port Leyden and that they be advised that the Public Health Law requires that a general comprehensive plan of a complete sewerage system for the village be submitted to the Department for approval before any sewers are constructed. After such plan has been approved only such portions of the sewerage system need be constructed as the village deems advisable, subject to approval of the State Commissioner of Health. I would further recommend that the existing conditions of nuisance be also called to the attention of the local board of health and that they be advised that it is within their power and jurisdiction and that it is their duty under the Public Health Law to cause the abatement of any nuisance found to exist in the village of Port Leyden. I would also recommend that copies of this report be transmitted to the village health officer and to the village board and that they be requested to follow the recommendations given above.

ALBANY, N. Y., *September* 8, 1914

A copy of this report was enclosed in a letter addressed to the local board of health on September 9, 1914, urging that steps be taken to carry out the recommendations contained in the report.

WILLIAMSVILLE

An investigation of sewerage conditions in the incorporated village of Williamsville, Erie county, was made on May 5, 1914, by C. A. Howland, sanitary inspecting engineer, in company with W. H. Baker, M. D., village health officer, as the result of a complaint made to this Department in regard to the pollution of Ellicott creek by sewage from the village.

Williamsville is situated in the town of Amherst about 3 miles northeast of the Buffalo city line. It is reached by trolley from Buffalo and the Niagara Falls branch of the Lehigh Valley railroad also passes through the village It is principally a residential section for people whose business takes them to Buffalo. No manufacturing interests of any size are located near the village with the exception of the Chalmers Gelatine Mfg. Co.

Williamsville is provided with a public water supply derived from springs in the village; and other modern facilities such as electric light, natural gas, etc., are available. A steady increase in the population is apparent from a comparison of census figures, this increase being greater in recent years. The present population is estimated at 1,300.

Williamsville is not provided with a public sewer system although three sewers have been laid in the village. Two of these sewers discharge directly into Ellicott creek which has a water shed area above Williamsville of about 85 square miles. The creek discharges into Tonawanda creek less than one-half mile above its junction with the Niagara river. Ellicott creek is not used for a public water supply either above or below Williamsville. The principal underlying rock formations of the region are limestone and shale overlaid by some three to five feet of porous material.

As a public water supply has been available since 1895, flush closets have been installed in a number of the houses. The health officer estimated that about one-third of the houses have installed them. The remainder of the houses use privies. There are apparently three general methods of disposing of the sewage from the flush closets, namely by discharge into cesspools, into settling tanks or by direct discharge into a water course.

Dr. Baker had prepared a map on which were shown the location of a large number of the privies, cesspools, settling tanks and points at which the direct discharge of sewage into a stream occurred. By a study of this map and from information obtained by the health officer it is estimated that the sewage from eight buildings discharges directly into Ellicott creek, and that the sewage from six houses discharges into cesspools close to the creek. An inspection of the creek was made, but as recent rains had greatly increased the flow and the water was turbid, no conditions of local nuisance were apparent at that time.

Sewage from the remainder of the buildings having flush closets is discharged into old wells, cesspools, excavated in the rock, or into settling tanks. The inspector was informed that these old wells and rock cesspools give little trouble, due to the fact that fissures in the rock provide channels through which the liquids seep away.

The settling tanks in the village are usually built of concrete and are roofed. They have either a single compartment, with submerged inlet and outlet, or have two or more compartments siphoning into each other. In the roof is an opening, the cover of which is cemented on so that the tank is air tight. Some of these tanks discharge into holes excavated in the rock, but in a large number of instances a nearby ditch or water course is used. In Howard avenue a sewer has been laid to carry off the overflow from six or seven settling tanks. This sewer is laid down Howard avenue from a point near Glen avenue, through an old raceway to Ellicott creek; a total length of about 1,500 feet.

Two of the settling tanks connected with this sewer have uncemented openings in the roof and the inlet tee is continued upward for cleaning. The sewer discharges just above an old dam, part of which has been washed away. The odor of fecal matter and the presence of toilet paper at the outlet indicated that there is also direct discharge of sewage into the sewer. A cottage is situated near this outlet and it appeared that previously a nuisance arose from the discharges; a condition which was remedied by changing the location of the outlet.

Another sewer passes down W. Cayuga street. It is alleged that at present this sewer receives only cellar drainage. The outlet is in an old quarry just beyond the intersection of Glen avenue. Complaints have been made of a nuisance arising from the discharges from this sewer and as such a sewer would not arise from cellar drainage alone, it is probable that there are connections for the discharge of other wastes. The village hall discharges into a sewer which passes a short distance down Main street to the creek.

The Board of Health of the village has recently passed an ordinance prohibiting the construction of cesspools unless they conform to approved plans.

Since the complaint, received by this Department, referred to the pollution of Ellicott creek by sewage, an inspection of other sources of pollution was made. At the Chalmers Gelatine Company's works, lime water is discharged into a stream which flows about one and one-quarter miles before it joins Ellicott creek. These wastes are settled in three basins which cover approximately one acre and said to average about three feet deep. No records are found in this Department of a report of such discharge having been received nor of a permit covering such discharge having been issued, therefore, this discharge of industrial wastes into a watercourse of the State constitutes a violation of the Public Health Law.

St. Frances Home, an asylum for aged people, is situated just below the village in the town of Amherst. The sewage from about 100 people is discharged into Ellicott creek without treatment. Although the home has been in its present location about twelve years, it has been considerably increased in size during that time and, therefore, the above discharge probably constitutes a violation of section 76 of the Public Health Law.

The inspector called at the residence of John Kline, the complainant. He was not there but the inspector talked with Mrs. Kline. She stated that ice is cut from Ellicott creek and that the water is used for cattle. For these reasons and to prevent a nuisance the present complaint was made, since it was believed that the pollution by sewage if allowed to continue would make the water unfit for use.

In connection with the study of the sewerage conditions in Williamsville, the inspector observed a number of new buildings which had recently been built near the reservoir of the public water supply. As this reservoir is built upon the rock without other bottom, the overflow from the settling tanks connected with these buildings is a source of danger to the water. The inspector was informed that at certain times when there is a heavy draft on the reservoir, the pumping draws down the water to such an extent that the water flows into the reservoir from the ditch which ordinarily carries off the overflow. This would increase the area from which polluton might be drawn into the reservoir. An examination of the results of bacteriological analyses of the water shows the repeated occurrence of fecal organisms, which, with the high bacterial count and lack of turbidity, indicates pollution of the spring through underground sources. Other analyses indicate that the reservoir is subject to surface wash.

From the above inspection it appears that the problem of properly collecting and disposing of the sewage in the village of Williamsville is a serious one.

Although it is claimed that properly constructed settling tanks operate efficiently in the rock, yet, it is apparent that in many cases the seepage is insufficient since every opportunity is taken of conducting an overflow pipe into a nearby ditch or watercourse. Even in some instances as Howard avenue, a sewer has been laid to carry off the overflow from a number of such tanks. Two other sewers have already been built, one of which discharges the sewage from the village hall into Ellicott creek. A large percentage of the property in the village is occupied by detached houses. A number of business places, however, are located on Main street which is an extended Buffalo street. It is inevitable that as the village grows, the congestion of stores in the business sections, necessary to cater to the increased population, will be greater. To properly dispose of the sewage from such a section in numerous settling tanks has been proved impossible by the experience of scores of municipalities in this State. It is not reasonable to expect that the village will continue to grow without the construction of sewers. This has already been begun in direct violation of the Public Health Law. The need that caused these sewers to be built will indicate the construction of others in the future but the proper course would be to provide for such sewer construction on a comprehensive basis.

The inspector was informed that it is proposed to build a storm sewer in the village and it is the experience of this Department that such sewers are frequently used afterwards to dispose of fecal waste in the absence of a sanitary sewer system.

It is claimed that the expense of constructing a system of sewerage and a sewage disposal plant would be prohibited because of the expense of the rock excavation. However, it is evident that each settling tank necessitates a certain amount of rock excavation, the cost of which might be applied toward a proper sewer system. In one instance, at least, not only the settling tanks, but also the sewer has been constructed, while the inspector was informed that a connection will probably be made with another sewer. Also the cost per capita of maintenance of individual disposal plants is greater than the cost per capita of the maintenance of a properly constructed sewerage system. By issuing a series of long term bonds the cost of constructing a sewerage system and sewage disposal plant can be reduced to an annual figure which is not burdensome.

In view of the above facts, I would recommend that the village authorities be advised that the only method which will adequately dispose of the sewage of the village and protect the health of the community is the construction of an adequate system of sewerage and a sewage disposal plant. Plans for such a system should be prepared by a competent engineer at the earliest possible time and submitted to this Department for approval as required by the Public Health Law.

Although this Department requires the submission of comprehensive plans covering the whole village, this does not mean that the whole system must be constructed at once. Only those portions which are necessary to properly dispose of the sewage from the village need be built. Application can be made for permission to omit from construction such parts of the system as are unnecessary, at the same time that application is made for approval of the plans.

In view of the fact that the Chalmers Gelatine Manufacturing Company has installed a series of sedimentation basins to remove the solids from their wastes, it appears that no marked effects of nuisance are created by the discharge of these wastes into a stream tributary to Ellicott creek. As it appears, however, that such discharge as at present carried on constitutes a violation of the Public Health Law, I would recommend that the Company be advised of this violation and that they be furnished with an application blank on which to make application for permission to so discharge these wastes.

The sewage of St. Frances Home should apparently receive some treatment before it is discharged into Ellicott creek. It is probable however, that the sewage from this institution could be cared for in the sewerage system of the village of Williamsville and for this reason it would seem advisable that the matter of caring for the sewage of the home as well as any action relative to the present illegal discharge of sewage into Ellicott creek within the village be held in abeyance until the steps to be taken by the village toward sewerage and sewage disposal have been determined, provided such action is not materially delayed.

In conclusion, I recommend that a copy of this report be transmitted to the health officer for presentation to the village officials and that they be urged to at once take up the question of having plans prepared for a modern system of sewerage and sewage disposal.

ALBANY, N. Y., *May* 14, 1914.

Copies of this report were inclosed in letters addressed to the village authorities on May 16, 1914, urging that the recommendations contained in the report be carried out.

In addition to the above, inspections were made or advice given through correspondence in matters relating to sewerage and sewage disposal at the following places: Greece, Elmhurst, Herkimer, Hobart, Huntington, La Salle, Medina, Newark, Northport, Port Henry, Schenectady County Tuberculosis Hospital, South New Berlin, Stamford, Syracuse, Tannersville, Tuckahoe, Watkins, Westfield, West Hampton, Webster and White Plains.

PROTECTION OF PUBLIC WATER SUPPLIES

GENERAL EXAMINATION OF PUBLIC WATER SUPPLIES

Many general examinations of water supplies have been made during the year following the receipt of requests for advice or inspections relative to insanitary or other special conditions affecting public water supplies. These examinations have usually required field inspections and as the results of such inspections reports have been prepared and advice given concerning the particular conditions involved.

The more important reports upon such general examinations are given below.

ARMOR (town of East Hamburg)

An investigation was made of sanitary conditions at the well at Armor, N. Y., which produces the "Alden Black Mineral Water" sold in the city of Buffalo.

A communication was received from the health authorities of Buffalo advising this Department that a bacteriological examination of this mineral water showed marked contamination. Following the receipt of this information Dr. Edward Clark, sanitary supervisor of District "O," was requested to investigate the source of this water and the following data is based upon Dr. Clark's report of his investigation.

The well from which the mineral water is obtained is located on the farm of Mr. Wm. Abbott at Armor, a small hamlet in the town of East Hamburg about 12 miles southwest of Buffalo. This well is a gas well about 1,700 feet deep, provided with three concentric casings. The outside casing is 6 inches inside diameter and extends through gravel and quicksand to rock. The second casing is 6 inches in diameter, extending to a depth of 1,400 feet and was put in to shut off from the gas the "black water" found at that depth. The gas is brought up through the innermost tube, which is 3 inches in diameter and 1,700 feet in depth. The well is tightly sealed in the manner usual in the case of gas wells.

The black water flows up along the outside of the 6-inch pipe and between this casing and the outer casing and is collected at the top by means of a small pipe discharging into a barrel. The rate of flow is about two barrels per 24 hours. After collection the water is poured into 5-gallon carboys and sent to the bottling works in Buffalo.

The well is located in a ravine about 1,400 feet from the house of Mr. Abbott. At the time of the inspection there were several families of Italian laborers living in small tenement houses about 200 feet from the well. The men work on the truck farm operated by Mr. Abbott. In all there are about 35 men, women and children living in these houses. The privies used by these people are of the ordinary wooden type with shallow pits dug in the earth. One of these privies is located but 24 feet from the well, and at the time of the inspection the privy pit was full of water and fecal matter, some of which had overflowed upon the surface of the adjacent ground. Another privy is situated about 80 feet from the well and although its pit was quite full there was no overflow. The privies are located at a somewhat higher elevation than the ground around the well. The soil in this vicinity is gravelly loam overlying quicksand. It is stated that at times of heavy rainfall the ravine in which the well and the privies are located becomes a watercourse for large volumes of surface water.

In addition to the inspection of the well and its surroundings the sanitary supervisor visited the "Pure Soda Bottling Plant" in Buffalo at which the mineral water is bottled. According to information given by the manager of the bottling works the water received from Armor is put into a tank and boiled for two hours, then filtered through two layers of filter paper, then diluted by the addition of carbonated city water filtered through a No. 2 stone filter and afterward bottled under a pressure of about 40 pounds.

The analysis of a sample of water collected at the bottling plant by the bureau of bacteriology of the department of health of Buffalo resulted in the finding of colon bacilli in quantities of water as low as 1/10 cubic centimeter.

A sample collected at the well at Armor by Dr. Clark was analyzed by the Division of Laboratories and Research and the results are given in the accompanying table. The chemical results do not allow any deductions as regards the sanitary quality on account of the large quantities of mineral constituents, the water being decidedly saline and saturated with hydrogen sulphide. The bacterial content is small, although fecal organisms of the B. coli type were isolated from one of three 10 c.c. inoculations.

In view of the above facts the following conclusions may be drawn:

1. That the sanitary surroundings of the well are decidedly objectionable, due to the close proximity of certain insanitary privies belonging to tenant houses of Italian laborers.
2. That, in case the outer casing of the well does not completely shut off surface water, there is potential danger of the spring water becoming contaminated from these privies.
3. That although the sample taken by Dr. Clark and analyzed by the Division of Laboratories and Research shows little active contamination the presence of organisms of the B. coli type in 30 c.c. indicates a small amount of contamination of animal or human origin.
4. That additional contamination may occur during the bottling process itself or from the use of unsterilized bottles.

It may therefore be recommended:

1. That the premises in the neighborhood of the well be put into satisfactory sanitary condition by the removal of the privies, careful removal and proper disposal of their contents and the protection of the vicinity of the well from surface wash by drainage ditches or such other means as may be found practicable.
2. That every precaution be taken to insure the freedom of the water from contamination during the bottling process and during all stages of its manipulation from the time it is collected at the well.

ALBANY, N. Y., *December* 18, 1914

NEW YORK STATE DEPARTMENT OF HEALTH

REPORT OF WATER ANALYSIS FOR ABBOTT WELL, ARMOR, EAST HAMBURG.

Laboratory No.
Source
Collected on September 12, 1914.
Color
Turbidity
Odor, cold, 5 d.
Odor, hot, 5 d.
Solids, total, 155,250.
Loss on ignition
Mineral residue
Ammonia, free, 2.4.
Ammonia, Alb., 30.0.
Nitrites
Nitrates
Oxygen consumed
Chlorine, 93,500.
Hardness, total
Alkalinity, 340.
Bacteria per c.c., 10.

$$\text{B. coli type....}\begin{cases}\text{10 c.c. } 1+2-. \\ \text{1 c.c. } 0+3-. \\ \text{1/10 c.c. } 0+3-.\end{cases}$$

High chlorides & H_2S.

Results are expressed in parts per million+present—absent.

Abbreviations used to describe odors of water: 0, none; 1, very faint; 2, faint; 3, distinct; 4, decided; 5, strong; 6, very strong; a, aromatic; d, disagreeable; e, earthy; f, fishy; g, grassy; m, musty; v. vegetable.

Copies of this report were transmitted to Mr. William Abbott, to Dr. Edward Clark, sanitary supervisor, and to Dr. F. E. Fronczak, health commissioner of Buffalo.

BEDFORD HILLS (New York State Reformatory for Women)

Plans for an intake well and infiltration gallery to serve as an additional or auxiliary water supply for the New York State Reformatory for Women at Bedford Hills, were submitted to this Department for approval on August 4, 1914.

It appears from the plans and report of the State Architect submitted with the plans that the existing water supply of the institution is derived from a covered well located between Broad brook, tributary to the Croton water supply and the institution power house. The well is about 30 feet from the stream and about 65 feet from the power house. It is constructed with double walls so as to form two concentric wells having inside diameters of 20 feet and 30 feet respectively. It is stated that the annular space between the two concentric walls of the wells is filled with charcoal through which the water which may seep through the side walls is supposed to filter.

The plans also show a 12-inch connection between Broad brook and the existing well and according to the data obtained during the inspection of the institution by a representative of this Department in 1911, there was a direct connection between the pumps at the power house and the brook. It was learned from the institution authorities at that time that although this connection was intended for use in case of fire it had never been used, the entire supply having been taken from the well. It appears from the results of the analyses of samples of water collected from the water supply during the past few years that there has been considerable variation in the quality of the water as indicated by the bacterial content and organic matter present. The number of bacteria per c.c. has varied from 40 to 18,500. Although no B. coli occurred in any of the 8 samples collected from the taps at the institution at different times during 1912, in 1910 and 1911 B. coli appeared in dilutions as small as 1 c.c., indicating contamination by organic matter probably due to seepage from the brook.

It is stated in the report of the State Architect that the present well is taxed to its full capacity and that it has become necessary to procure an additional supply to provide for the new buildings which are being constructed at the institution.

The plans now presented show that it is proposed to construct an additional covered well and an infiltration gallery to furnish the required additional supply. The proposed well is to be located about 20 feet from the existing well some 35 feet from the stream and about 40 feet from the power house. It is to be 20 feet inside diameter and 20 feet deep and is to be constructed with concrete walls the lower portion of which is to be perforated with 3-inch weep holes spaced 3 feet apart center to center. The lower portion of the outside of the wells is to be back filled with gravel. The new well is to be connected with the existing well by means of a 12-inch pipe and will also connect with the pumping station through a 10-inch suction pipe.

The proposed infiltration gallery is to consist of a line of 24-inch tile extending along the brook for a distance of about 180 feet from the wells. The pipe is to be laid with open joints in a trench protected with plank sheeting. The lower portion of the trench surrounding the pipe is to be back filled with gravel. The pipe line is to be laid from 15 to 30 feet from the stream and is to connect with both the existing and proposed wells by means of 12-inch cast-iron pipes provided with valves so that water collected by the pipe may discharge into either of the two wells.

In conclusion I would state that it appears from our examination of the plans that although the proposed well and infiltration gallery would augment the present supply considerably it would not furnish a supply better if equal in quality to that now furnished the institution. The attention of the institution authorities and of the Fiscal Supervisor of State Charities has already been called (1911) to the need of providing for a more satisfactory supply at that time.

In view of the above and owing to the questionable quality of the present water supply of the institution as indicated by the results of analysis of the water, I would recommend that the plans be not approved and that the State Architect be advised to follow out the recommendations embodied in the report of the sanitary inspection of the institution in 1911, namely that a new supply of unquestionable quality possibly by filtering the water in the stream be adopted.

ALBANY, *August* 19, 1914

In accordance with the above recommendation the plans were not approved. Subsequently a second set of plans was submitted to this Department on November 21, 1914.

It is proposed to add to the present system a second dug well in order to increase the amount of water supplied. The plans submitted show the well located about 10 feet west of the existing well, 20 feet east of the power house and about 60 feet distant from the bank of the brook. The proposed well is shown circular in cross section, 30 feet inside diameter and 30 feet deep below the present surface of the ground. The well is to be constructed of reinforced concrete and provided with a cover of the same material. The bottom of the well will be unlined and infiltration through the sides will be provided for by weep holes consisting of 3-inch tile pipes through the lower part of the side wall. These tiles will be arranged in lines 3 feet apart vertically and the individual tiles will be spaced 3 feet center to center.

From this well a short length of 10-inch cast-iron pipe will connect with the present suction line of the pumps in the power house. This new line and also the old line to the present well will be provided with a 10-inch gate valve. The suction line in the new well will terminate in a foot valve located 2 feet above the bottom of the well.

In connection with the improvement of the water supply the existing cesspool which receives the sewage from the power house is to be abandoned and back filled. From the power house a new line of 5-inch cast-iron sewer is to be laid draining to a new cesspool, 190 feet north of the power house and about 300 feet from the new well. This cesspool is shown on the plans as 7 feet in diameter and 7 feet deep, constructed with a dry rubble wall and provided with a reinforced concrete top, in which will be a manhole. The invert of the sewer pipe entering the cesspool will be 3 feet above the bottom.

While the bottom of the cesspool will be 26.5 feet above the bottom of the new well, the location of the cesspool, the distance between it and the well, the character of the soil and the topography of the vicinity would indicate little if any danger of contamination of the well from this source.

It is impossible to state definitely without data furnished by test pits and pumping tests, whether an adequate supply will be obtained from this well at all times and under all conditions. However, in case the need for additional water should arise, an auxiliary supply might be obtained by providing driven wells or by increasing the flow into the new well by extending lateral lines of drainage tile from it.

The sanitary quality of the water that will be obtained from this well cannot be positively predicted, although from a consideration of the surroundings of the well, it would seem reasonable to assume that a water of satisfactory sanitary quality will be obtained. In case, however, this supply should not prove entirely satisfactory from the sanitary standpoint, it could be adequately safeguarded by some means of chlorination.

From an examination of the plans, it would appear that the proposed well, if properly constructed in accordance with the plans and if its surroundings are kept free from contamination, would produce a satisfactory potable water supply and I would, therefore, recommend that the plans be approved.

ALBANY, N. Y., *November* 24, 1914

The plans were approved on November 25, 1914.

FULTON

An investigation of the public water supply of the city of Fulton, Oswego county was made on March [illegible]

Fulton is a manufacturing city of approximately 12,000 population located in the western part of Oswego county on the Oswego river about ten miles inland from Lake Ontario. Branches of the New York Central and Hudson river, New York, Ontario and Western, and Delaware, Lackawanna and Western railroads connect Fulton with Syracuse and Oswego. The Syracuse and Northern Interurban electric railway from Oswego to Syracuse also passes through this city as does the Oswego branch of the New York State Barge canal.

Fulton has numerous mills and factories for the manufacture of paper, woolen goods, firearms, chocolate, etc. There are two large dams across the Oswego river at Fulton developing considerable water power for use in the various mills. Two large locks of the Barge canal are located here and the water front along the east bank of the river has been improved by the construction of docks.

The city is served by a public sewer system built on the separate plan. A sewage disposal plant, not visited at the time of this inspection, has been constructed for the western section of the city but raw sewage from the main part of the city is discharged into the river.

The public water supply was originally developed by a private company in 1885 and was purchased by the city in 1900. The waterworks are operated under the direction of the Board of Public Works of which Mr. Frank Rumsey is superintendent. Practically the entire population of the city is supplied from the municipal water works through about 2,500 service taps, nearly all of which are metered. The water is pumped to the city and distributed through thirty-four miles of cast-iron mains ranging in size from four to ten inches. A new reinforced concrete standpipe, located on a knoll in the eastern part of the city receives any excess of water pumped and acts also as a pressure maintaining tank. The daily consumption of water averages 1,100,000 gallons, a large portion of which is used by the mills and factories, the exact amount of water used for commercial purposes is not known. Nearly all the mills and factories obtain supplementary supplies from either Lake Neatahwanta or the Oswego river and the piping systems of those mills which are connected with both the city supply and an auxiliary supply are provided with check valves designed to prevent influx of water from the auxiliary supplies into the city main. Experience has shown that the positive action of these check valves cannot be depended upon in case of emergency and in several cities the failure of such valves to operate properly has caused the mixing of polluted water from an auxiliary supply with the water in the city distribution system with resultant outbreaks of typhoid fever.

The source of the public water supply is a series of four wells or springs, known as springs Nos. 1, 2, 3 and 4. Springs 1 and 2 are near the pumping station which is about one mile south of the city, while springs 3 and 4 are about one mile south of the pumping station. Spring No. 1 is connected directly with the pumps and acts as a pump well into which the water from the other wells drains. The water from spring No. 4 flows into spring No. 3 through a 10-inch tile pipe; from spring No. 3 the water flows to spring No. 1 through about 4,000 feet of 12-inch pipe, about one-half of which is cast-iron.

Spring No. 2 is also connected with this pipe line. There are two manholes in this line connecting the springs, one of which has been recently reconstructed and the other has been covered by fill from the Barge canal work. The springs are developed by sinking steel caissons, 20 feet in diameter and 15 feet deep, at places where there have been evidences of natural flow.

Springs 1 and 2 are in low ground about 300 feet from the Oswego river. The land in the vicinity of these springs is protected from flood conditions by a dike thrown up along the river bank. Springs 3 and 4, are on higher land and back from the river about one-quarter mile. These wells are above the waters of a small brook which flows between them.

The inspection of the water supply was made by Mr. E. S. Chase, assistant engineer in this department, following a request from the city authorities for analyses of water from a new spring proposed as an addition to the present supply. It was deemed advisable that an inspection should be made of this supply at such time as flood conditions in the Oswego river would be most liable to bring about possible contamination of the supply. A previous inspection and report was made by Prof. H. N. Ogden, special assistant engineer, which will be found in the Thirty-third Annual Report of this Department for the year 1912, page 885. From the evidence put forth in the report of Professor Ogden the conclusion was drawn that under certain conditions infiltration into springs 1 and 2 and leakage into the pipe line occurred from the Oswego river. Since this inspection in 1912, improvements and changes have been made with the view of preventing possible flooding of the wells with water from the river.

At the time of the recent inspection a heavy rainfall and melting snow had brought about a flood condition in the Oswego river. This flood began on March 26, and reached its crest on March 30 or 31. Flood gates at the upper Fulton dam control the elevation of the water above the dam or upper level and it was thus possible, by opening these gates wide, to prevent the level from rising more than two feet above the crest of the dam. As the pumping station of the water works and the springs are located on the bank of the upper level the difference in elevation between the water in the springs and in the river was not more than two feet greater than usual.

On March 28 samples of water for bacteriological analysis were taken from each spring of the public supply, from a tap in the pumping station and from the Oswego river. On March 30 samples for both chemical and bacteriological analysis were taken from the same points and also from the new spring proposed as an additional source. Samples from spring No. 3 are admixtures of water from springs 3 and 4 while samples at the pumping station and in the city are admixtures of water from all four springs. In addition to these samples one for bacteriological examination was taken from a semipublic spring in the city. The results of the analysis of these samples together with others made in the past by the State Hygienic Laboratory are given in the appended table. In connection with the bacteriological results of the samples taken March 28, it should be noted that the high counts may be partly due to multiplication in transit.

The analyses of the samples from springs 3 and 4 indicate that at the time of the recent inspection a certain amount of active contamination was reaching these springs, this being shown by the high bacterial counts and the presence of organisms of the B. coli type. From a consideration of the surroundings of these springs it seems probable that this contamination is largely due to infiltration of surface run-off from farm lands and from an adjacent barnyard. With the exception of the house and barn within 200 feet of spring No. 3 there are no buildings within 1,000 feet of these two springs. At the time the recent samples were taken the high water in the river had caused the brook flowing near the springs to flood the low land north and this flooding caused the brook to back up to a point about midway between the springs Nos. 3 and 4. This rise in level of the brook may have brought about a more rapid infiltration of surface water into the springs and a correspondingly less efficient purification in passing through the soil. While there may have been some leakage into the line of tile connecting the springs the joints in this line are said to have been carefully made in order to prevent such leakage. As the tops of the caissons were well above high water there was no chance for the flooding of the springs by overflow. Another possible explanation for the presence of colon bacilli in these springs is that the heavy rains had washed dust and dirt from the covers of the springs into them. The presence of colon bacilli in the dust of this vicinity would be expected from the proximity of the cow barn. The most probable explanation, however, is the leaching into the springs of rain water which has passed through soil contaminated with cow manure. This view is borne out by the somewhat greater contamination in the water from spring No. 3 shown by both chemical and bacteriological results, spring No. 3 being practically located in the barnyard.

The analyses of the samples from spring No. 2 are excellent from a bacteriological standpoint. The low total numbers of bacteria and the absence of organisms of the B. coli type in quantities as large as ten cubic centimeters indicate little or no active contamination at the times the samples were taken. On the other hand the chemical analysis shows extremely high values for chlorine and mineral residue and fairly high figures for free and albuminoid ammonia. This spring which is about 200 feet from the Oswego river may receive a certain amount of infiltered river water but it should be noted that the chlorine in the spring water is higher than is shown in any analyses made in the past of the river water, being about double the average chlorine value in river water analyses. While it is impossible to rule out all possibility of infiltration of river water, it seems extremely probable that these high chlorine and mineral residue values are the effects of some local salt deposits. In this connection it is significant to note that several years ago a gas well was drilled about one-half mile northeast of this spring and that at a depth of 1,200 feet a salt vein was struck from which a large quantity of salt water was pumped to the surface. It seems probable that the water in spring No. 2 is a mixture of ground water coming from the east and of the Oswego river water from the west and the high chlorine and mineral residue values may be due largely to the influence of local salt deposits while the high ammonia values may be the result of the infiltration of river water.

Owing to the fact that the waters from the other three springs flow into spring No. 1, it was impossible to obtain a sample of this spring alone. However, the results of the analyses of the mixed waters indicate that little, if any, added contamination took place in this spring. Taking into consideration the surroundings of spring No. 1, it seems possible that at times active contamination may have reached its water. This spring is only a few feet south of the pumping station and about 300 feet east of the Oswego river. Along the bank of the river at this point the State has built a large dike in connection with the Barge canal work. This dike keeps the river water within bounds and prevents it from flooding the low land in the vicinity of springs Nos. 1 and 2. On the inland side of this dike and at its foot runs a ditch designed to drain the low land within the dike. This ditch begins about one-half mile south of the pumping station and discharges into the river below the upper Fulton dam. Some trouble has been experienced in the past with this ditch becoming choked with weeds and flooding the land near the pumping station, but at the time of the inspection this ditch was carrying the water freely past the pumping station. Two or three acres between the pumping station and the dike constitute a slight natural depression in which at times stagnant water accumulates. It is claimed that this stagnant water has affected the quality of the water in spring No. 1 although there are no analytical data to bear out this conclusion.

Other sources of possible contamination of the ground water are four or five houses within a few hundred feet of the station. Although these houses receive the public water supply they are served, with one exception, by outside privies. The second story of the pumping station is occupied by one of the engineers and his family. The discharges from the sanitary conveniences of this apartment and from a house on the opposite side of the street are carried off by the drain pipe which carries away the exhaust condenser water from the pumping engines. This pipe discharges into the ditch at the dike opposite the station and the water flows away from the vicinity. For a period last year this drain became clogged or broken and the discharge from it took place into the ground much nearer the spring. This condition has been remedied. On the whole the discharge of sewage within such a short distance of spring No. 1 is attended with considerable danger of pollution of the waters of the spring, especially at times of year when no water is flowing in the ditch.

When spring No. 1 was first put into service, it is said, the ordinary dug wells in the neighborhood went dry. While pumping is being carried on the level of the water in the spring is about 18 to 20 feet below the surface of the ground and it is therefore evident that this well forms a sump towards which the subsurface water for a considerable area tends to drain. This 18 or

20 feet represents approximately the depth of the spring below the level of the river and on account of the dam at Fulton this difference in level probably does not vary much with different stages of the river. With this difference in level it seems extremely likely that a certain amount of infiltration occurs from the river, this amount depending upon the hydrostatic condition of the ground water.

Previous to the reconstruction of the pipe line connecting the springs, evidence pointed to the probable contamination of the water supply by leakage into this line of river water at times of flood. Since the improvements to this line it seems likely that trouble from this source has been obviated and this conclusion is borne out to a certain extent by the analyses of the mixed water which do not show an increase of contamination over that present in springs Nos. 3 and 4.

During the reconstruction of the pipe line from springs Nos. 3 and 4, a flowing spring was encountered about one-quarter mile north of these springs. This new spring was not connected with the pipe line but an iron pipe has been sunk at its location and water can be obtained from it by means of a small hand pump. As the city authorities desire to connect this spring with their present supply, samples of this water were taken for chemical and bacteriological analyses. These results of analyses are given in an appended table and show a water very low in bacteria and with no organisms of the B. coli type in quantities as large as 10 c.c. With the exception of the high chlorine value the chemical results also indicate a water of good quality. This high chlorine may be the result of local salt deposits or due to some infiltration from the Oswego river. The land in the immediate neighborhood of this spring is in a fairly good sanitary condition as there are no dwellings or other buildings within seven or eight hundred feet. The land is low and marshy but the soil is composed of fine sand and gravel which would probably afford good natural filtration. From a single analysis it is not possible to state that this spring will yield a satisfactory quality of water at all times and under all conditions of ground water flow and furthermore it cannot be predicted what effect the development of greater draft upon the spring would have upon the quality of its water.

Another spring, located in the city of Fulton and known as the Church spring has been suggested as an additional source of supply. A sample from this spring was taken for bacteriological analysis the result of which indicates that at the time the sample was taken the bacterial content was satisfactory. The development of this spring as a part of the public supply, situated as it is in the midst of a thickly built up section, cannot be too strongly condemned. Experience has shown that springs or wells so located inevitably become contaminated and frequently infected with specific disease germs.

In dealing with questions arising in connection with ground water supplies many problems arise which are difficult of satisfactory solution except after a long series of careful and time consuming observation. The quality of water in springs and wells is liable to sudden modifications due to changes in hydrostatic conditions of the ground water, these changes being dependent upon well defined natural causes such as rainfall, drought, frost, floods, etc., which acting singly or in conjunction with one another may bring about changes which cannot be predicted with limited data. This difficulty is further enhanced by the fact that the effects of such natural causes are often appreciable only after considerable intervals of time.

At Fulton, conditions are such that definite statements as to all the causes affecting the quality of the water supply cannot be made at the present time, but with the evidence in hand the following conclusions may be set forth:

1. That, the water in springs Nos. 3 and 4, is marked by different chemical constitutents from that in spring No. 2 (and probably spring No. 1) and that this difference is due in all probability to the effect of local salt deposits, infiltration from the Oswego river, or a combination of both upon the lower springs.
2. That a small amount of active contamination reaches springs Nos. 3 and 4, due to seepage into the springs of surface water contaminated with the leachings from the privy, barn and cattle yard of the nearby farm.

3. That the new spring near the pipe line was producing a water of good sanitary quality at the time of the inspection, but the continuance of this quality cannot be assured.

4. That the recent changes in the pipe line connecting the springs have had a tendency to improve the quality of the water supply by preventing to a large extent the danger from leakage during flood conditions.

5. That improvements in the sanitary conditions of the land in the vicinity of some of the springs, will result in an improvement in the sanitary quality of the water from these springs.

6. That the use of the Church spring as a source of additional supply would be attended with considerable potential danger on account of its poor location.

7. That there is some danger of the polluted auxiliary water supplies reaching the city water mains through leaking or improperly acting check valves.

In view of the above conclusions I beg to submit the following recommendations:

1. That the city authorities improve the conditions in the vicinity of the springs Nos. 3 and 4, by fencing these springs off from the adjacent fields and by acquiring and removing the farm buildings near spring No. 3.

2. That the low land near the pumping station in which stagnant water is liable to accumulate, be better drained or filled in with clean gravel.

3. That in order to prevent accidental or wilful contamination of the springs, all the covers over the same be kept in good repair and the entrances to them be kept locked.

4. That the sewage carrying condenser water from the pumping station be discharged through an iron pipe into the river, or if this is impracticable, that the end of this line be extended a sufficient distance from the vicinity of the springs as to give rise to no possibility of their pollution.

5. That the city authorities make inspections of the piping of the auxiliary water supplies at the mills and that careful tests be made of the operation of the check valves connected with these systems.

6. That in case the quantity of water which can be obtained from the present springs becomes insufficient for the needs of the city, the authorities consider carefully the development of an additional supply of unquestioned purity and that, before such development shall be carried out, the city retain the services of a competent water supply engineer to make the requisite studies for securing an adequate supply of proper quality.

ALBANY, N. Y., *April* 21, 1914

ANALYTICAL DATA OF WATER SUPPLIES

Abbreviations used to describe odors of water: 0, none; 1, very faint; 2, faint; 3, distinct; 4, decided; 5, strong; 6, very strong; a, aromatic; d, disagreeable; e, earthy; f, fishy; g, grassy; m, musty; v, vegetable

Municipality	County	Source of sample	Date of collection	PHYSICAL				CHEMICAL (PARTS PER MILLION)											BACTERIOLOGICAL			
						ODOR		SOLIDS			NITROGEN AS —						HARDNESS			B. COLI TYPE + = PRESENT — = ABSENT		
				Color	Turbidity	Cold	Hot	Total	Loss on ignition	Mineral residue	Free ammonia	Albuminoid ammonia	Nitrites	Nitrates	Oxygen consumed	Chlorine	Total	Alkalinity	Bacteria per c.c.	10 c.c.	1 c.c.	1-10 c.c.
Fulton	Oswego		1/11/12	Tr.	Cl.	....	....	416	94	322	.004	.004	.003	0.72	0.90	132.00	175.5	106.0	70	—	—	—
Fulton	Oswego		2/17/12	5	Cl.	....	....	414	70	334	.018	.024	Tr.	0.60	1.00	138.00	120.0	101.0	20	—	—	—
Fulton	Oswego		4/ 3/12	Tr.	Cl.	....	....	484	105	379	.006	.028	.001	0.60	0.90	160.00	154.2	102.0	500	+	+	—
Fulton	Oswego		4/25/12	Tr.	Cl.	....	....	433	88	345	.002	.034	Tr.	0.80	1.40	155.00	197.2	104.0	250	+	—	—
Fulton	Oswego		10/10/12	5	Cl.	....	....	510	108	402	.004	.040	Tr.	0.80	1.80	170.00	235.5	113.0	50	+	—	—
Fulton	Oswego		11/28/12	10	Cl.	....	....	495	33	462	.010	.060	.001	0.50	2.00	155.00	169.0	107.0	4,000	+	—	—
Fulton	Oswego		1/13/13	5	Tr.	1 v.	1 v.	309	....	....	.008	.044	.001	0.80	1.20	74.00	117.2	97.0	1,900	3+0—	2+1—	2+1—
Fulton	Oswego		2/18/13	Tr.	Cl.	1 v.	1 v.	437	....	....	.018	.034	.001	0.70	1.00	135.00	157.2	107.0	5	—	—	—
Fulton	Oswego	Well No. 2	3/27/13	....	....	....	....	....	....	....	....	....	....	....	....	275.00	....	....	650	+	—	—
Fulton	Oswego	Well No. 3	3/27/13	Tr.	Cl.	....	....	128	27	101	.026	.044	.001	0.90	1.00	2.87	97.2	88.0	220	+	+	—
Fulton	Oswego	Well No. 4	3/27/13	Tr.	Cl.	....	....	119	26	93	.016	.024	Tr.	0.90	0.90	2.00	87.1	79.0	300	+	+	—
Fulton	Oswego	Public supply	3/27/13	Tr.	Cl.	....	....	321	73	248	.010	.030	Tr.	0.70	1.10	88.00	154.2	99.0	500	+	+	—
Fulton	Oswego	Public supply	1/ 1/13	5	Tr.	1 v.	1 v.	236	....	....	.018	.048	.001	0.70	1.00	58.00	125.5	95.0	540	3+0—	0+3—	0+3—
Fulton	Oswego	Well No. 2	4/11/13	Tr.	Cl.	....	....	636	96	540	.034	.038	.003	0.50	1.40	240.00	188.6	101.0	80	+	—	—
Fulton	Oswego	Well No. 3	4/11/13	Tr.	Cl.	....	....	144	28	116	.006	.024	.003	0.90	0.90	3.12	91.4	89.0	70	+	—	—
Fulton	Oswego	Well No. 4	4/11/13	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	15	—	—	—
Fulton	Oswego	Public supply	4/11/13	Tr.	Cl.	....	....	313	62	251	.006	.024	.001	0.90	0.90	79.00	156.0	98.0	60	—	—	—
Fulton	Oswego	Public supply	5/13/13	Tr.	Cl.	1 v.	1 v.	359	....	....	.008	.012	.001	0.70	0.70	101.00	134.2	99.0	140	—	—	—
Fulton	Oswego	Public supply	6/24/13	Tr.	1	1 v.	1 v.	461	....	....	.006	.018	.001	0.60	0.60	128.00	151.4	106.0	1,900	3+0—	0+3—	0+3—
Fulton	Oswego	Public supply	7/29/13	Tr.	Tr.	1 v.	1 v.	576	....	....	.010	.020	.001	0.70	1.70	1.70	151.4	109.0	....	3+0—	1+2—	0+3—
Fulton	Oswego	Well No. 2*	3/28/14	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	75	0+3—	0+3—	0+3—
Fulton	Oswego	Well No. 3*	3/28/14	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	9,900	3+0—	0+3—	0+3—
Fulton	Oswego	Well No. 4*	3/28/14	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	5,400	1+2—	0+3—	0+3—
Fulton	Oswego	Tap, pumping station*	3/28/14	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	8,100	2+1—	0+3—	0+3—

Fulton	Oswego	Oswego river*	3/28/14	...	...		....	....	....	....	....	....	....	....	......	......	......	44,000	3+0—	2+1—	0+3—
Fulton	Oswego	Well No. 2	3/30/14	Tr.	Cl.		1200	267	933	.072	.044	.001	0.70	2.80	545.00	165.8	125.0	10	0+3—	0+3—	0+3—
Fulton	Oswego	Well No. 3	3/30/14	Tr.	Cl.		133	25	108	.032	.046	.001	1.00	1.00	2.87	92.9	89.0	7,300	3+0—	0+3—	0+3—
Fulton	Oswego	Well No. 4	3/30/14	Tr.	Cl.		123	28	95	.010	.028	Tr.	0.70	0.40	2.25	82.9	82.0	120	1+2—	0+3—	0+3—
Fulton	Oswego	Tap at pumping station	3/30/14	Tr.	Tr.		560	120	140	.016	.026	.001	0.70	2.40	190.00	208.0	110.0	1,600	2+1—	0+3—	0+3—
Fulton	Oswego	Tap in city	3/30/14	Tr.	Cl.		528	101	427	.018	.040	.001	0.66	1.70	190.00	182.0	108.0	950	0+3—	0+3—	0+3—
Fulton	Oswego	New spring	3/30/14	Tr.	2		205	21	184	.012	.014	.001	0.04	0.60	30.00	36.4	135.0	20	0+3—	0+3—	0+3—
Fulton	Oswego	Oswego river	3/30/14	20	40		300	64	236	.128	.182	.005	0.56	6.40	52.00	140.0	78.0	47,500	3+0—	3+0—	2+1—
Fulton	Oswego	Church spring	3/30/14	...	...		....	....	....	....	....	....	....	....	......	......	......	70	0+3—	0+3—	0+3—

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* Received in laboratory March 31, 1914.

Copies of this report were transmitted to Dr. F. E. Fox, mayor of Fulton, and to Dr. G. G. Whitaker, health officer.

GREENWOOD LAKE (town of Warwick)

An investigation of an outbreak of typhoid fever at Greenwood Lake and also an inspection of the general sanitary conditions at this lake were made on October 7 and 8, 1914.

Greenwood lake is located in the hilly region of southern New York and northern New Jersey. This lake is about 6.9 miles long, .7 mile wide, its long axis lying in a general northerly direction. About one-half of the lake is in each State. The vicinity of this lake is a very popular summer resort and during the season there is a large number of visitors. Two or three hundred cottages are situated along the shores of the lake and there are also several summer hotels and boarding houses. In addition to the permanent dwellings there are a great many temporary camps during the summer. It seems probable that several thousand people visit the lake annually for varying lengths of time. During the winter large quantities of ice are cut and stored in two ice houses of 70,000 tons capacity each.

A previous investigation of an outbreak of typhoid and an inspection of the sanitary condition of the hotels and dwellings located on the shore of the lake was made August 31, 1912, by Mr. C. A. Howland, inspecting engineer of this Department, and the report of this investigation is published in the Thirty-third Annual Report of this Department, page 782. At the time of the inspection in 1912 numerous instances were found of insanitary conditions in respect to both water supply and sewage and garbage disposal. At that time certain conclusions and recommendations were made and the ones particularly significant at this time are as follows:

Conclusion No. 5:

"That the most significant circumstances in connection with the origin and spread of the disease are the decidedly insanitary conditions existing at Greenwood Lake and the pollution of the lake itself."

Recommendations:

3. "That all water taken from the lake be boiled even when used for washing and general purposes until such time as it is certain that all dangerous pollution is removed from the water. And that the visitors at the lake be warned that its use for drinking purposes is dangerous.
4. "That all closets having vaults or permanent containers or buckets of any kind be abandoned and removed in all cases where flush closets are installed and that the immediate installation of the latter be recommended in all cases.
5. "That where recommendation (4) cannot possibly be followed that the privies be removed at least 100 feet from the lake or any well and provided with tight vaults protected by fly screens. The use of chloride of lime as a disinfectant is recommended.
6. "That settling or septic tanks be installed to receive all sewage to be followed by some method of subsurface irrigation or other filtration.
7. "That no stable for cattle, horses, barnyard, hogpen, poultry house or yard, hitching place or standing place for horses or other animals, manure pile nor compost heap be located, placed, maintained or allowed to remain with its nearest point less than 100 feet from the lake or its branches.
8. "That all garbage be disposed of by burial, burning or removal in a sanitary manner.
9. "That the proprietors of the different hotels be impressed with the fact that the maintenance of strict sanitary conditions is imperative.

"It is believed by this Department that the local hotel proprietors will realize that an outbreak such as has occurred at Greenwood Lake has been a great disadvantage to the locality and that only the most stringent steps toward improved sanitation will prevent a recurrence of typhoid fever at the lake in the future."

The attention of this Department was called to the recent outbreak of typhoid by J. K. Adams, M. D., of Orange, N. J., and M. Farkas, M. D., health officer of West Orange, N. J., as the cases occurred on a small island in that portion of the lake situated within the State of New Jersey and some of the cases were taken to the Orange hospitals. The investigation was made by Mr. E. S. Chase, assistant engineer in this Department, and the following facts in regard to the outbreak were obtained:

During the months of August and September, seven known cases of typhoid have occurred at this lake, all of these cases being within the State of New Jersey. Six of the cases originated at a summer hotel on Storm's Island, an island two or three acres in area, located just south of the State boundary and near the eastern shore of the lake. The seventh case occurred near the railroad station of Greenwood Lake Glens, about one mile from Storm's Island, and as far as could be determined was not connected with the cases on the island.

In addition to the hotel on Storm's Island there are seven or eight small cottages located around the shore of the island. These cottages probably obtain their water supply largely from the lake. The sanitary conveniences consist of three privies located from 5 to 20 feet from high water mark of the lake. Two of the privies are provided with removable containers although these containers were evidently leaky. The contents of these containers, it is claimed, are disposed of by burying at some point in the middle of the island.

The hotel, the construction of which was finished only this spring, is located approximately in the center of the island. It has a capacity of about 20 or 30 regular guests although transient guests may be as high as 50 or 60 on week ends and holidays. There are two sources of water supply for the hotel. The drinking water is obtained from a mountain brook on the east bank of the lake about 1 mile from the island. The water is collected in large carboys and brought to the island. So far as known the point at which the brook water is collected is above any source of contamination. The water for the toilets, baths, dish washing, etc., is taken from the lake. A gasoline pump in the basement of the hotel pumps the water into an air pressure tank from which it is distributed through the building. Previous to the outbreak of typhoid the end of the intake for the lake water was located about 40 feet from the high water mark of the lake but since the outbreak the pipe has been extended some 20 or more feet into the lake. The sewage of the hotel is discharged into two cesspools, each approximately 6 feet square and 4 or 5 feet deep the sewage flowing first into one, then into the second. From the second cesspool a blind ditch allows the overflow to percolate into the lake. The soil in which the cesspools are dug is hardpan and in all probability very little seepage through the soil occurs and nearly all the overflow probably drains through the ditch into the lake. The line of this ditch is practically parallel to and but 3 feet distant from the suction line of the water supply and the point at which the cesspool overflow reaches the lake shore is only 40 or 45 feet from the original location of the intake. The above facts indicate clearly the ease with which contamination of the water supply of the hotel from the lake might be brought about by the overflow from the cesspools. In this connection it should be noted that the line of water pipe is on the suction end of the pump and that contamination might easily take place through leaky joints or other holes in the pipe.

In respect to the cases of typhoid the information in respect to each is summarized as follows:

1. Mrs. McL., 40 yrs.; onsnt about August 29, worked in kitchen, washed clothes in lake near ditch from cesspool, had been in good health all summer and had been on island since some time in May.

2. Mrs. D., 35 yrs.; onset about September 3, friend of proprietor's wife, helped in kitchen, came to island during middle of summer from Paterson, N. J.

3.–4. Mrs. and Miss C., wife and daughter of proprietor, 40 yrs. and 20 yrs. respectively; onset September 7. Mrs. C. did most of cooking, Miss C. helped in kitchen.

5. Miss F., 35 years.; onset September 27, maid of Mrs. R. (case 6), came to island about August 1.

6. Mrs. R., 30 years.; onset September 28, guest at hotel for summer, came to island about June 3.

As far as could be determined none of the cases had been recently associated with any previous case of typhoid prior to this outbreak. Neither is there any evidence of the infection being obtained away from the island. The milk supply was derived from a cow kept on the island. It is, however, significant that the dishes and vegetables were washed in the lake water supply. Although there is no definite information of a typhoid convalescent visiting the island, there was a rumor that a young man camping on the island had just recovered from the disease.

The circumstances attending this outbreak and the sanitary condition of the hotel's lake water supply lead to the conclusion that the cause of the outbreak was the infection of this supply by the sewage from the hotel or by bathers, boating parties, or other chance sources. However, the sewage of the hotel seems the most important factor in this connection, for among the large number of visitors to the hotel there were, in all probability, typhoid carriers or typhoid convalescents. An attempt to trace the source of the original infection would undoubtedly end in failure and would be of little additional value. It is of course impossible to state the exact channel of the infection and while the occasional use of the lake water for drinking would seem the most probable way for infection to be caused, there was also the danger from the use of dishes and vegetables washed in the water. The last two cases may have been due to secondary infection. Experience has shown that in case of dual water supplies there is always strong possibility of the less safe supply being used to some extent for drinking purposes. In the present instance it seems probable that the lake water was used by the women working in the kitchen either for drinking directly or for diluting coffee or tea.

This outbreak is extremely significant in view of the sanitary condition at the other hotels at the lake and especially so in view of the warning given by this Department in 1912 of the potential danger of such conditions. At the time of the recent inspection several of these hotels located in New York State were visited and information obtained in respect to sanitary conditions, particularly regarding water supply and sewage disposal. This information may be summarized as follows:

Woodlands Hotel, C. W. Page, proprietor; 38 rooms, capacity about 70. Water supply for drinking from spring on hill back of hotel, contamination possible from drainage of two privies about 100 feet distant on higher ground. Water supply for toilet purposes, dish washing, etc., from lake, intake 20 feet from high water mark, short distance from hotel. Sewage disposal, concrete cesspool 50 feet from lake, cleaned every fall, possibility of overflow from vent pipe, kitchen sink wastes discharged into surface gutter which drains into lake a few feet from water intake. Garbage fed to pigs. Barn on shore of lake near intake.

Ferncliff Hotel, Mrs. Whiteside, proprietor; capacity about 175. Water supply for drinking from spring on hill above hotel, said to be all right and no houses noticed above hotel. Water supply for toilets and dish washing, etc., pumped from lake, intake a few feet off shore and near hotel. Sewage discharged into cesspool, then pumped into second cesspool two or three hundred feet from hotel. Both cesspools said to overflow at times and at time of inspection they were nearly full and appearance of ground in vicinity indicated that such overflow had taken place. Sewage overflowing from cesspools would flow or be washed into lake a short distance from water intake. A boat house connected with hotel has several rooms used by boarders and this boat house has a watercloset which discharged into a barrel a few feet from the water's edge. Overflow from this barrel must find its way almost directly into lake. Garbage from hotel hauled to dump near second cesspool. Sanitary conditions very bad.

Willow Point Hotel, W. C. De Graw, proprietor. Three houses at this place under one management. Water supply for drinking from mountain spring and source probably satisfactory. Auxiliary supply pumped from dug well near shore of lake and used when spring supply is insufficient. Possibility of contamination by surface wash. Sewage and kitchen sink wastes discharged into separate cesspools. As these cesspools are some distance from lake there is probably little direct pollution except in case of overflow. Soil at this particular hotel apparently sand and gravel.

Mountain Spring Hotel, C. K. Kasse, proprietor; capacity 75 to 100. Water supply from mountain spring until about the 1st of August, supply then runs short and lake water pumped for use in toilets, etc. Drinking water then obtained from spring near kitchen. Cesspool about 200 feet from hotel.

Maplewood Inn, C. R. Lautergung, proprietor; capacity 35. Drinking water from open dug well near house. Water for toilets, etc., pumped from lake. Sewage discharged into large cesspool near house and about 100 feet from lake. Soil sand and gravel and probably no overflow occurs. Little danger to lake but well water may receive contamination from seepage of cesspool. Second cesspool for laundry wastes some distance from house and well back from lake. Garbage carried away by farmer. Premises in good condition.

Waterstone Hotel, E. T. Waterstone, proprietor; capacity 50. Water supply for drinking from spring on hill above house, no permanent sources of contamination. Water for toilets, etc., pumped from lake. Intake at dock in front of house. Sewage discharged into cesspool south of hotel about 75 feet from the lake. At time of inspection this cesspool was full and a rubber garden hose was noticed, placed in such a manner as to allow the siphoning off of liquid contents. Liquid thus siphoned off would flow into a culvert under the highway and thence into the ground about 50 feet from the lake. This cesspool was uncovered and protected in no way from flies.

Brandon Hotel, Joseph Kalsch, proprietor; capacity 80. Drinking water from spring on side hill and probably satisfactory from sanitary standpoint. Auxiliary supply for toilets, etc., pumped from lake. Sewage discharged into cesspools, location unknown but probably located some distance from lake. Garbage taken away by farmer.

Sterling Forest Hotel, Frederick Brauchle, proprietor; capacity 70. Water supply from dug well about 150 feet north of hotel, no lake water used. Sewage discharged into cesspool 100 feet from lake.

In addition to the hotels listed and described above there are several boarding houses and three hotels which were not visited owing to the limited amount of time available. The conditions described, however, are representative and show practically no improvement over those described in the previous report in the year 1912.

It is therefore evident that numerous opportunities exist for serious contamination of the waters of the lake from permanent sources and this contamination can occur at such points as to afford every chance for dangerous contamination of the auxiliary lake water supplies of the various hotels. Furthermore, there are many opportunities for contamination of the lake from temporary sources, such as fishermen, campers, bathers, etc. Although these auxiliary supplies are provided for toilet flushing, dish washing and other similar purposes and are not supposed to be used for drinking, the availability of a contaminated water supply in a hotel is potentially dangerous and at any time this potential danger may become active as evidenced by the recent outbreak at Storm's Island.

The general insanitary conditions noted at certain of the hotels in respect to sewage and garbage disposal may also become factors in the spread of disease, particularly during the fly season. Furthermore, such conditions may also menace the drinking water supplies derived from springs or wells.

Another danger which might arise from the insanitary conditions around the lake and the pollution of the lake by sewage is that of contamination of the ice supply derived from the lake. Although the chances for serious contamination of the ice crop are comparatively slight, due to the purifying action of the process of freezing and the germicidal action of cold and long storage, the importance of this industry is sufficiently great to warrant every precaution to prevent even the slightest possibility for contamination of the ice.

This investigation indicates clearly the continued need of carrying out of the recommendations made in the report of the investigation of August, 1912, in respect to water supply, sewage disposal and general sanitary cleanliness at the hotels and cottages around Greenwood lake. It is a matter of first importance for the hotels at Greenwood Lake to be provided with safe and adequate water supplies. It is also important to keep the contamination of the lake itself at a minimum. The problem involved in obtaining such water supplies and in preventing pollution of the lake necessitates a detailed investigation of the needs and conditions at each hotel and should be easy of solution if studied by a competent sanitary engineer. In this connection it might be advisable for the hotel proprietors to adopt some cooperative method of employing a qualified expert to look into and study the needs of the various hotels with the view of providing safe water supplies and satisfactory and sanitary methods of sewage and garbage disposal.

As a result of this investigation the following conclusions may be drawn:

1. That the outbreak of six cases of typhoid fever at the hotel on Storm's Island was due to the infection by sewage of the auxiliary water supply derived from the lake.
2. That conditions in respect to water supply and sewage disposal at many of the other hotels at this lake are practically no different from those at the hotel on Storm's Island and that under similar combination of circumstances, like outbreaks of typhoid may occur.
3. That the general sanitary conditions at the various hotels and cottages are in many instances decidedly insanitary, particularly in respect to garbage and sewage disposal.
4. That the discharge, overflow and washing by rains of sewage into the lake occur at such points as seriously contaminate the water supplies taken from the lake.
5. That unless immediate steps are taken by the various hotel proprietors, acting either singly or together to improve the serious conditions described in this report, there is every possibility for the continuance of typhoid fever at this lake.
6. That in order to remedy these conditions a sanitary engineer is required to study the problem and to advise as to the necessary means for procuring safe water supplies and proper disposal of wastes.

Immediate action on the part of the hotel proprietors is necessary in order to have all insanitary and dangerous conditions remedied before another season. Disregard of the warnings given by this Department and failure to carry out its recommendations are almost sure to result in frequent outbreaks of typhoid, some of which may be very serious and disastrous.

ALBANY, N. Y., *October* 19, 1914

Copies of this report were transmitted to Dr. Jacob C. Price, Secretary of the New Jersey State Board of Health, to Dr. H. N. Bradner, health officer of the town of Warwick, and to Dr. M. Farkas, health officer of West Orange, N. J. Dr. C. W. Berry, sanitary supervisor, also sent a copy of the report to each one of the hotel proprietors at Greenwood lake.

LYONS

An inspection of a well at Lyons, N. Y., from which drinking water is obtained for supplying the passenger coaches of the Pennsylvania division of the N. Y. C. & H. R. R. R. was made on April 24, 1914, by Mr. E. S. Chase, assistant engineer in this Department, following a request from the local board of health for device relative to the use of this well. The assistant engineer was accompanied and aided by Dr. M. A. Veeder, health officer of Lyons.

The well is located in a small strip of lawn about seventy-five feet west of the passenger station of the railroad. The water from this well is used by possibly 100 persons each day besides its use for the railroad coaches and consequently it may be considered as a semipublic water supply.

This well was driven sometime in November or December, 1913, and has replaced another well about 200 feet distant which was condemned by the local board of health. The condemned well was located in low ground, which at times became flooded with surface water carrying wash from privies, garbage dumps and other insanitary places.

The present well is driven through about thirty-four feet of sand, gravel and clay and consists of an iron casing about six inches in diameter into which an inch and a quarter suction pipe extends. A wooden cover about four feet square is placed around the top of the well and upon this platform is fastened an ordinary hand pump. Aside from this platform no other provision has been made to prevent surface water from running down the side of the casing into the well and it is stated that when the well was first put in service the water tasted strongly of humus and was warmer than would have been expected of a ground water. Lately this condition has improved somewhat due probably to the silting up of the space between the casing and the surrounding soil.

Aside from the passenger and freight stations there are but few houses in the vicinity of the well. The nearest house is about 200 feet distant, while there are perhaps ten houses within a radius of 500 feet, none of these houses is connected with sewers but each is provided with an outside privy and the slope of the land is such that there is little likelihood of surface wash from these places reaching the vicinity of the well. A sewer from the passenger station leaves the building about seventy-five feet from the well and runs in an easterly direction for several hundred feet until it discharges into a marsh. A few feet north of the well are the main line tracks of the railroad and a few feet south are the tracks of the Pennsylvania division and just beyond the latter tracks is a highway. A strip of lawn extends westward from the well and this lawn is said to be fertilized with manure.

At the time of the inspection, a sample of well water was taken and has been analyzed by the State Hygienic Laboratory with the following results expressed in parts per million:

Color, trace; turbidity, 10; total solids, 1,429; loss on ignition, 265; mineral residue, 1,164; free ammonia, 0.168; albuminoid ammonia, 0.038; nitrites, 0.001; nitrates, 0.06; oxygen consumed, 1.40; chlorine, 63.5; total hardness, 743; alkalinity, 366; bacteria per c.c., 50; B. coli type, absent in 10 c.c. inoculations.

While it is impossible to draw any sweeping conclusions from a single analysis, owing to the fact that under varying hydrostatic conditions of ground water varying analytical results are often obtained, it is possible to point out in a general way the indications of this analysis. The high figures for hardness and chlorine are probably explained by the fact that outcrops of Salina limestone occur in this vicinity. The figures for free ammonia and oxygen consumed are higher than would be expected in an uncontaminated ground water although the other nitrogen figures are fairly low. The bacterial count is moderate and the nonoccurrence of organisms of the B. coli type in quantities of water as large as 10 c.c. indicates that at the time of the inspection there was little active contamination. It must be emphasized, however, that one analysis can show but little more than the condition of the water at the time one sample was taken and that absence of positive indications of active contamination in such a sample in nowise insures the continuance of the same quality of water. Under other conditions of rainfall and ground water it is possible that entirely different results might be obtained.

While it is evident that the location of the present well is better than that of the one it replaces, it cannot be considered as entirely satisfactory or free from potential danger of contamination. The proximity of the sewer from the passenger station, the nearness of the railroad tracks giving opportunity for pollution from the railroad coaches, and the still further possibility of pollution of the soil in the vicinity of the well by some of the large number of people who pass it each day, are all factors which must be considered as possible sources of contamination the dangers from which are difficult to guard against. However it is evident that certain improvements can be made which will afford greater protection to the well from surface drainage. These improvements should consist of replacing the wooden cover by a concrete slab, so placed around the top of the well as to prevent any direct drainage of surface water into the well or along the casing. Furthermore a pipe or trough should be placed so as to carry the waste water from the pump several feet away from the well. In view of the fact that this well is used to supply passenger coaches with drinking water it would seem advisable for the railroad company to have frequent analyses carried out, thereby affording a means of keeping check on the quality of the water.

In conclusion I would recommend that copies of this report be sent to the local Board of Health of Lyons and to Mr. H. P. VanDusen, agent, N. Y. C. & H. R. R. R., at Lyons.

ALBANY, N. Y., *May* 14, 1914

Copies of this report were transmitted to Dr. M. A. Veeder, health officer and to Mr. H. P. VanDusen, agent, N. Y. C. & H. R. R. R. at Lyons.

NORTH TONAWANDA

The city of North Tonawanda takes its water supply from the Niagara river a few miles below the city of Buffalo, which pours its raw sewage into the river. This water supply has for many years been known to be unsafe, not only through laboratory tests, but also from the high typhoid fever rate that has existed. During the months of October and November, 1914, there was an undue prevalence of typhoid in the city amounting almost to an epidemic.

Realizing the importance and seriousness of the situation at North Tonawanda, Dr. Biggs authorized the Engineering Division to purchase a chlorination apparatus and immediately install and operate it for the city for a period of about six weeks. The plant, which was of the portable type, was installed under the immediate supervision of the writer on short notice. In fact, it was installed and put in operation within 24 hours from the time work was begun upon it. The cost of the apparatus and installation was less than $300, and the cost of chlorine was about $1 per day for the population of about 12,000.

Before the plant was started a series of water samples was collected at five different points of the water supply system and sent to the State Laboratory for analysis. Five subsequent series of samples were collected from the same sampling points after the plant was put in operation. The first series of samples, before chlorination, showed total bacterial counts ranging as high as from 1,200 to 1,400 per cubic centimeter, with the presence of sewage bacteria in all samples tested. In the five series of samples collected after the chlorination plant was in operation, the total bacterial count was reduced to less than 50 per cubic centimeter, with the entire absence of sewage bacteria. Furthermore, in the brief interval since the plant was put in operation, typhoid fever which had up to this time continued excessive, has almost disappeared.

The action of the Department in this case was an experiment, an object lesson as it were, which fortunately was promptly taken advantage of, for word was received, December 30, 1914, from the city authorities of North Tonawanda, that bids would be received within a few weeks for a new plant to take the place of the one temporarily installed by the Department.

It is the purpose of the Department to hold this temporary plant in readiness as an emergency outfit, to be installed and used in case of any sudden outbreak of disease due to infection of a water supply, or to install it in places like North Tonawanda where the water is known to be contaminated and the typhoid fever rate is above the normal, as an object lesson to induce the municipality or water company to install a permanent plant and render its supply safe. The efficacy and economy of chlorination plants having been fully demonstrated, there seems no adequate excuse for not insisting at least upon their temporary installation until municipalities can afford the more costly methods of treatment by sand filtration.

POUGHKEEPSIE HUDSON RIVER STATE HOSPITAL

An inspection of the water supply of the Hudson River State Hospital was made on February 25, 1914.

This institution is located on the eastern bank of the Hudson river about two miles north of the city of Poughkeepsie. There are about 3,300 patients and 700 employes at present. The medical superintendent is Dr. Charles W. Pilgrim.

The hospital has its own water supply derived from the Hudson river at a point near the hospital. The intake is about 50 feet from the eastern bank of the river and is protected by a crib work of timber filled with rock. From the river the water is pumped by low lift centrifugal pumps to the purification works which are on the bank near the intake. These works consist of a pumping station, a preliminary coagulating and sedimentation basin, a dry alum feed device, two units of slow sand filters, a hypochlorite plant and a clear water basin. From the clear water basin the water is pumped directly to the institution by the high service plunger pumps. Two reservoirs with a combined capacity of about 3,000,000 gallons are located one mile east of the hospital. These reservoirs serve chiefly to equalize the flow, receiving excess pumpage during the night and supplying some stored water during the day. The daily water consumption is estimated at 660,000 gallons or 165 gallons per capita per day.

The intake to the pumping station is located only one-fourth mile above the sewer outfall from the hospital itself and about two miles above the sewers of Poughkeepsie. It is said that on flood tide there is evidence of sewage matters in the close vicinity of the intake. Trouble has also been experienced at certain conditions of water level in the river due to insufficient depth of water at the end of the suction pipe from the low lift pumps, and these pumps can be operated but 18 hours a day, the reserve storage in the coagulating basin being drawn upon to supply the high service pumps and filters. It has been proposed to extend this intake some 300 feet northwest into the river to a ledge of rock. The water at this point is said to be free from the influence of the local sewers and to be of much better quality. No action has been taken in regard to this extension as yet.

Since February 2, 1914, the slow sand filters have been out of service for the purpose of thoroughly cleaning the sand. This sand had become so clogged that it was impossible to filter sufficient water to supply the hospital. With the filters out of service the water has been treated by coagulation and sedimentation followed by application of hypochlorite of lime. Bacteriological analyses of the treated water have been made by Dr. Carpenter, pathologist of the hospital, and these analyses have indicated that the sanitary quality of the water, even after chlorination, has been far from satisfactory. As soon as the filters were put out of service the hospital authorities issued orders for the boiling of all water used for drinking or culinary purposes but in an institution of this character strict obedience to such orders is difficult to enforce.

In consequence of the apprehension felt by the hospital authorities a request was made to this Department by Hon. Lewis F. Pilcher, State Architect, for analyses of the water. Following this request an inspection was made by Mr. E. S. Chase, assistant engineer in this Department. This inspection was made chiefly to determine the method of operation of the hypochlorite plant and the efficiency of the process.

This hypochlorite plant consists of a cylindrical wooden tank 6 feet in diameter and 4.5 feet deep with a capacity of about 875 gallons. This tank is both mixing and solution tank. Every morning the tank is filled with water and the hypochlorite is added in the form of a thick paste and mixed with the water by stirring by hand with a wooden paddle. The hypochlorite is weighed out and mixed with water before adding to the mixing tank in order to break up the lumps as much as possible. From the mixing tank, near the bottom, an iron pipe about one inch in diameter leads to a small wooden box containing a copper float. This pipe is provided with a globe valve near the tank, so set that the tank will empty itself in 24 hours. The solution of hypochlorite flows from the tank to the wooden box, then through a pipe in the side of the box into a funnel and through this funnel to a line of 1-inch pipe through which the solution flows into the water at a well in the filter control house. In case the outlet from the box becomes clogged the copper float rises with the solution and closes a slide valve in the end of the pipe from the mixing tank and thus prevents an overflow of the solution. The hypochlorite is applied after the water has gone through the clear water basin.

As the rate of pumping throughout the 24 hours is usually fairly constant it is necessary that the hypochlorite solution should be applied at a nearly uniform rate. A careful consideration of the design of this sterilizing plant shows that this end is not obtained under the present conditions. This regulation of the flow of solution is made by the globe valve between the mixing tank and the float box and this valve is set so that the tank will empty once in 24 hours. According to a hydraulic law the rate of discharge from this tank will be in proportion to the square root of the head of solution in the tank. Consequently with the tanks full and a head of 4.5 feet the discharge will be at three times the rate it would be with the tank nearly empty with a head of 0.5 feet. Therefore, it is evident that with constant rates of pumping about three times as much solution will be applied to the water when the bleach tank is full as when it is nearly empty; the amount decreasing as the tank empties. A modification of this apparatus might be devised whereby the float and slide valve would be adjusted so as to maintain a constant head over an orifice or, preferably, a triangular weir, the orifice or weir being so designed as to allow the proper rate of application of solution.

For about a year and a half previous to the present time hypochlorite has been used subsequent to filtration. The amount put into the mixing tank each day was 6 pounds and this same quantity was used until February 13, 1914, when the amount was increased to 13 pounds, although the filters went out of service February 2. On February 26 the amount was to be increased to 15 pounds. Estimating the available chlorine in the bleach at 33 per cent. and the quantity of water treated daily at 660,000 gallons, the theoretical amount of available chlorine added has been 0.36, 0.78 and 0.90 parts per million respectively.

The operation of this sterilization plant is attended to by the regular force employed at the purification works. This force consists of three men, one on each 8-hour shift during the 24 hours. These men operate the pumping station, firing the boilers, watching the pumps, and when the filters are in operation attend their operation. A great deal of the time of these men is employed in looking after the pumping station, and as the hypochlorite plant is located in a small building some distance from the pumping station, it is impossible for the attendants to see at all times whether the bleach is being applied or not. In fact at times the flow of bleach solution has stopped for such long periods that one-third the contents of the mixing tank remained in the tank at the end of the 24 hours.

At the time of the inspection samples of water were taken for bacteriological analyses in order to determine the degree of efficiency of the hypochlorite treatment. The results of these analyses made by the State Hygienic Laboratory are given in the accompanying table.

These results show clearly that the sterilization of the water is not accomplished and the efficiency of the treatment is very low. The number of bacteria in the water after treatment is very high and the presence of organisms of the B. coli type in quantities of treated water as small as 1/10 cubic centimeter shows conclusively the dangerous condition of the water. The somewhat lower numbers of bacteria in the water from the taps in the hospital than in the water from the tap at pumping station indicate the need of sufficient time for the bleach to complete its sterilizing action, although this evidence is somewhat complicated by the fact that stored water might be coming back to the hospital from the reservoirs.

At the time of the inspection a measurement was made of the amount of bleach solution added during the five hours from 10 a. m. to 3 p. m. This amount was found to be 225 gallons, corresponding to a drop in level of 1.03 feet. During the same period the number of revolutions of the high service pump in operation increased from 40 to 50 per minute. Samples of the bleach solution as actually applied to the water were taken at 10 a. m. and at 3 p. m. These samples were analyzed at the State Hygienic Laboratory for the amount of available chlorine. These analyses showed 168.65 and 88.04 parts per million respectively of available chlorine in these samples and thus brought to light the fact that the strength as well as the rate of application of the bleach solution is decidedly variable. An approximation of the actual amount of available chlorine added to the water at this time can be made from the data collected. Taking 40 as the average number of pump revolutions per minute and assuming 15 per cent. slippage, the amount of water pumped during the 5 hours was approximately 191,000 gallons. The average strength of the bleach solution as shown by analyses was 127.35 parts per million of available chlorine and the amount of solution added was 225 gallons. These figures give the approximate amount of available chlorine actually added to the water as .148 parts per million or about ⅕ the amount figured from the weight of bleach added to the mixing tank. The comparatively small amounts of available chlorine in the bleach solution as well as the variations in the strength of the solution is probably due to the failure to obtain sufficient mixing of the bleach with the water in the mixing tank.

The irregular operation, at times, of the sterilizing plant, the variations in the rate of application and in the strength of the bleach solution and the failure of the solution to be of estimated strength are all cumulative evidence showing the inadequacy of the present plant to accomplish an efficient sterilization of the water.

The above facts emphasize again the conclusion reached from past experience that sterilization of drinking water by hypochlorites can be carried out successfully only under expert supervision and with the aid of regular chemical and bacteriological tests.

In conclusion I beg to submit the following recommendations:

1. That the hospital authorities retain at once the service of a consulting expert to put the sterilizing plant into proper shape, to supervise its operation during the time the filters are out of service and to advise them in respect to the best means for obtaining proper supervision of the entire purification works from now on.
2. That in the meantime, owing to the low efficiency of the hypochlorite, all water used for drinking purposes be boiled and that unusual precautions be taken to enforce this provision.
3. That the authorities of the hospital consider the extension of the raw water intake farther into the river in order to obtain, if possible, a better quality of raw water less subject to the influence of local sewage discharge, and also to obtain opportunity for pumping water at all stages of tide, especially during the latter part of ebb tide when the raw water is most free from pollution.

The protection of the health of the inmates and attendants in a hospital of this sort is of paramount importance and experience has taught that it is very difficult to prevent persons drinking impure water if easily accessible, especially if boiled water is the substitute or alternative. It is therefore urged that the proper State authorities act at once to carry out the provisions of these recommendations.

ALBANY, N. Y., *March* 10, 1914

HUDSON RIVER STATE HOSPITAL, POUGHKEEPSIE, N. Y.

Bacterial Analyses of Water, February 25, 1914

SAMPLE	Time	Bacteria per c.c.	B. COLI TYPE					Alkalinity
			LACTOSE BILE			LACTOSE BROTH		
			10 c.c.	1 c.c.	1-10 c.c.	1-10 c.c.	1-100 c.c.	
Hudson river raw water	9:15 A. M.	5,600	3+0—	3+0—	3+0—	2+1—	3+1—	....
Effluent coagulation basin (alum treated water)	9:35 A. M.	1,400	3+0—	3+0—	3+0—	3+0—	2+1—	....
Effluent coagulation basin (alum treated water)	9:30 A. M.	2,300	3+0—	3+0—	1+2—	3+0—	0+3—	....
Tap in pump station (hypochlorite treated water)	9:30 A. M.	2,100	3+0—	3+0—	2+1—	2+1—	0+3—	40
Tap in laboratory at hospital (hypochlorite treated water)	12:25 P. M.	430	3+0—	1+2—	0+3—	3+0—	0+3—	....
Hudson river raw water	3:05 P. M.	4,000	3+0—	3+0—	3+0—	3+0—	3+0—	....
Effluent coagulation basin	3:10 P. M.	4,500	3+0—	3+0—	2+1—	3+0—	1+2—	....
Effluent coagulation basin	3:20 P. M.	950	3+0—	2+1—	3+0—	3+0—	0+3—	....
Tap in pumping station	3:25 P. M.	1,900	3+0—	3+0—	2+1—	3+0—	0+3—	40
Tap in laboratory in hospital	4:55 P. M.	600	3+0—	2+1—	0+3—	3+0—	0+3—	....
Tap in laundry in hospital	4:45 P. M.	1,000	3+0—	1+2—	0+3—	2+1—	0+3—	....

Hypochlorite 10 A. M., available chlorine — 168.95 p. p. m.
Hypochlorite 3 P. M., available chlorine — 86.04 p. p. m.
+ = Present.
— = Absent.

Copies of the above report were transmitted to Dr. Chas. W. Pilcher, medical superintendent of the hospital, to Hon. Lewis F. Pilcher, State Architect, and to the State Hospital Commission.

ROCHESTER

An inspection of the sanitary conditions existing upon the watersheds of Hemlock and Canadice lakes, said lakes being sources of water supply of the city of Rochester, was made on August 5 and 6, 1914, by Mr. E. S. Chase, assistant engineer in this Department, at the request of Mr. B. C. Little, superintendent of the bureau of water of the city of Rochester.

Hemlock lake is situated about 30 miles south of Rochester at an elevation of about 386 feet above the general level of the city. The lake is 6.6 miles long, 0.6 mile wide and has an area at ordinary low water of 1,825 acres and an average depth in the middle of 65 feet. Including the water surface its drainage area is 47.5 square miles, a large portion of which is hilly and, in the immediate vicinity of the lake, covered with woods. The area not adjacent to the lake is largely cleared land devoted to agriculture. Only one settlement of any size is located on the watershed and this is the village of Springwater, three miles south of the head of the lake with a present population of 325. Including this village the total population upon the watershed is approximately 1,527 or 32 per square mile.

Canadice lake lies about two miles east of and 200 feet higher than Hemlock lake. It is 3.1 miles long; 0.3 mile wide and has an average depth in the middle of 70 feet. At ordinary low water it covers an area of 648 acres and has a total drainage area of 13.9 square miles. In addition to the watershed tributary to the lake alone, the area draining to the stream which forms the outlet from the lake must be considered. This additional area is the territory tributary to the outlet stream above the point where the conduit diverts the Canadice water to Hemlock lake. This conduit leaves the outlet about 3 miles below the lake and its additional watershed is 5.5 square miles, so that the total watershed area of the Canadice supply is 19.4 square miles. This area is devoted to agriculture and is fully 75 per cent. cleared land. There are no settlements of any size located on this watershed and the total population is 272 or 14 per square mile.

The daily water consumption in Rochester is approximately 30,000,000 gallons. At present this supply comes solely from Hemlock lake but as soon as a third conduit to the city which is now under construction is finished it is intended to use the Canadice supply also. There are now two intakes from Hemlock lake, both in about 26 feet of water and 1,000 and 1,500 feet respectively from the northern shore. Gate chambers on the shore control the flow and also contain screens. These screens are removable and have a mesh of 1/8 inch. The conduit from the Canadice supply discharges into Hemlock lake at its northern end a few feet from shore.

Hemlock lake and its tributaries are protected from contamination by rules and regulations enacted by this Department in 1885. Furthermore a special act of Legislature (chapter 1018, Laws of 1895) has given the city of Rochester the power to acquire by condemnation proceedings a strip of land 200 feet from high water mark around the lake in order to guard against contamination. Under this act the city has purchased nearly the entire shore of the lake and has removed about 200 summer cottages formerly existing along the shore. The city has also purchased by arrangement land further back from the shore until at present it owns about 3,600 acres of the watershed adjacent to Hemlock lake. With the exception of about one mile of water front the shore of Canadice lake has been bought by the city which has also bought strips of land along each bank of the outlet stream from this lake. On the Canadice watershed several hundred acres are owned by the city.

In order to keep a constant watch upon the sanitary condition of the Hemlock watershed and to prevent as far as possible contamination of the waters of the lake and its tributaries the city maintains a regular force of five sanitary inspectors who constantly patrol the watershed. While boating is not absolutely prohibited on Hemlock lake there are only about 12 boats used by private individuals on the lake.

Canadice lake is not protected by rules of this Department and while many steps have been taken to remove possible sources of contamination, these steps have not been quite so complete as is the case with the Hemlock watershed. While several summer cottages have been removed from the shores of Canadice lake, there still remain about 30 located near the head of the lake. Boating is also carried on quite extensively during the summer.

On both watersheds the city plants upon its property several thousand young pine trees every year.

This spring a change in the course of a brook formerly not tributary to the Hemlock watershed added about 4.5 square miles of drainage area to this watershed. The population of this addition is estimated at 200, and this figure and that for the area added are included in the figures given for the total population and area of the Hemlock watershed.

The assistant engineer was accompanied and aided on his inspection of Hemlock lake and its shores by Mr. McGrady, gate keeper at this lake, and on the inspection of Canadice lake and the watersheds of both lakes by Mr. Shelter, sanitary inspector. The inspection covered the shores of both lakes and the greater part of both drainage areas, about 80 miles of highways on the watersheds being traversed.

On the inspection, conditions at several points were noted which may be considered as possible sources of contamination and the principle places at which such conditions exist are listed below.

HEMLOCK LAKE AND WATERSHED

At the northern end of the lake and along the west shore there are five or six summer cottages and one farm and while there are but about 150 feet of shore at this end of the lake not owned by the city, this amount is sufficient to allow access to the lake by the cottagers. At most of the cottages the sanitary conditions are fairly satisfactory and the privies either located well back from the lake or provided with removable containers the contents of which are removed and destroyed by the sanitary inspectors of the city. There are, however, three places at which conditions are not satisfactory:

1. At the Rix farm a small tributary to the lake runs directly through the hog-yard, and receives at times of rainfall barnyard wash.
2. At the Woodruff cottage a privy is located but 10 feet from the steep banks of a small stream which discharges into the lake a few hundred feet distant.
3. About opposite the Woodruff cottage is a 16-foot right of way to the lake, controlled by George Rix and several others. On this right of way and at the edge of the lake a boat has been built. At the time of the inspection, fecal matter of human origin was noted in and around this boat house at distances from the water's edge ranging from 10 to 20 feet. It is evident that rains will wash this material into the lake. Furthermore, it is apparent that the people using this boat house are of extremely careless habits and that their use of the lake for boating and fishing is a menace to the sanitary quality of the water.

The entire east shore of the lake is owned by the city with the exception of about 100 feet midway the length of the lake. This place is owned by E. M. Holden, and a cottage is built close to the lake. At this cottage the privy is provided with removable containers taken care of by the city, but the privy is located only 5 feet away from the steep banks of a small stream which enters the lake about 50 feet distant. This location of the privy is bad, for even though provided with removable containers, it might, either through carelessness or accident, become a source of contamination of the water of the lake.

Upon the watershed, away from the immediate shores of the lake, the most serious condition may be considered the village of Springwater. This village is located in a level valley plain through which Springwater creek flows on its way to the lake. The village is about 3 miles from the head of the lake and at an elevation of about 75 feet above the level of the lake. There are in all approximately 75 houses in the community which is purely residential having no industries. Until two years ago the village had no public water supply but at that time a gravity supply was installed, obtained by impounding a spring fed brook in a small open reservoir on the side hill east of the village. At present 32 houses are served by this supply and since its introduction, inside closets connected with cesspools are replacing the outside dry privies, formerly used. There are now about 15 cesspools in the village. The soil under some parts of the village is apparently somewhat porous for instances have been cited of cesspools built for several years and used continuously without cleaning. It is therefore possible that seepage from cesspools may reach Springwater creek inadequately purified by passage through the soil. There is also the possibility of the contamination of wells still used for drinking and culinary purposes in the village itself.

The opportunities in the village for contamination of Springwater creek by surface wash are numerous. There are two branches of the creek which flow through the village and which unite just north of the village to form the main creek. Along the west branch there are comparatively few houses but the east branch flows for a short distance along one of the village streets and for about ½ mile through the back yards of ten or twelve houses. For some distance through the village the stream is confined between low dikes. These dikes not only tend to prevent flooding of the village at times of high water but also serve to keep the surface drainage of the village from reaching the stream as readily as it otherwise might.

Springwater has recently built a new central schoolhouse with a capacity of 125 pupils. This building is located about midway between the two branches of the creek. The schoolhouse is equipped with inside plumbing connected with a cesspool, although as yet no water closets have been installed. At present only the roof drainage system, the surface and subsurface drainage of the cellar and one washbowl have been connected with the cesspool. While this cesspool is located fully 500 or 600 feet from the west branch of the creek, the school authorities have dug a ditch from this cesspool to within 50 feet of the creek. The cesspool was originally built tight but owing to the need for drainage a hole was made near its top and excess water led into the ditch. It is evident that should this cesspool be used to receive sewage or other polluted water the overflow would reach the stream in a comparatively short time: especially would this be true at times when rain water from the roof would cause a flushing out of the contents.

In the territory outside of Springwater the conditions are typical of a farming section and in only a few places were conditions such as might be considered objectionable. At the Robinson, Lawrence and Waite places, privies were noted very close to Springwater creek or its tributaries. At district school No. 13, in the town of Springwater, the privies were so located as to probably cause contamination of a branch of the creek. At the Barbor place near the village of Springwater a manure pile was partly in a small tributary of the creek.

CANADICE LAKE AND WATERSHED

The shore of Canadice lake is not so nearly in the control of the city of Rochester as is that of Hemlock lake. However, the city does own the west shore with the exception of about one mile along the southwest end of the lake and all but about 250 feet of the east shore. On the mile of shore on the west side of the lake there are 20 summer cottages occupied during a few months of the year and having an average population of about 30 during that time. The conditions around these cottages are very good and the privies are as a rule well back from the shore. Along the east shore there are three houses or cottages and conditions are fairly good.

While the city owns strips of land on both sides of the outlet stream, extending from 200 to 400 feet from the stream, there are three points at which the banks are not owned by the city. Along the stream the following objectionable conditions were noted:

> 1. At the Costello place a privy is located on the edge of a ditch draining into the outlet several hundred feet distant. At a schoolhouse a privy is located within 20 feet of a small tributary to the outlet.
>
> 2. At the Grove Mather place a little over a mile above the point where the water of the stream will be directed to Hemlock lake, a privy is situated on the very edge of a small stream discharging into the outlet about 200 feet distant. At this place the sink drain discharges into the small stream and the barnyard is poorly located.

On the territory back from the lake and outlet the conditions are similar to those existing on the Hemlock watershed, with this exception that there is no village of any size on the watershed. Only one particularly bad condition was noted and this was at district schoolhouse No. 3, of the town of Canadice. Here the privies are at the top of a steep bank about ten feet from a tributary stream which reaches the lake about ½ mile distant. The condition and location of these privies are very bad.

While the city of Rochester has devoted a great deal of effort towards the sanitary protection of its water supply, it is evident from the inspection that there still remain a few conditions upon the watersheds which require remedial measures. Those conditions noted along the outlet of Canadice lake and those in the immediate vicinity of Hemlock lake on account of their proximity to the intakes should be remedied at once. The rules and regulations for the protection of the water supply, enacted by this Department in 1885, cover Hemlock lake and its watershed only and as these rules were drawn up nearly 30 years ago they are not so complete or as satisfactory as a revised set of rules might be made. Several conditions of possible contamination are not covered at all in the old rules and other conditions are not sufficiently restricted.

I would therefore recommend that the city of Rochester be advised to make formal application to this Department for the enactment of revised rules and regulations for the protection from contamination of its water supply derived from both Hemlock and Canadice lakes in order that the cooperation of this Department may be more effective.

ALBANY, N. Y., *August* 24, 1914

A copy of the above report was transmitted to Mr. B. C. Little, superintendent of the bureau of water of the city of Rochester.

SARATOGA SPRINGS (Public water supply)

An inspection of the public water supply of the village of Saratoga Springs was made at the request of Linsly R. Williams, M. D., deputy commissioner of health, for an investigation into the cause of high turbidity and unpleasant tastes and odors in this supply. The inspection was made on August 15, 1914, by Messrs. E. S. Chase and L. R. Milford of this department, accompanied and aided by Dr. C. S. Towne, health officer of Saratoga Springs.

A previous investigation of this supply was made by a representative of this department on June 21, 1911, and the report of this investigation may be found on page 769, volume 2 of the Thirty-second Annual Report of this Department. Briefly summarized, the conclusions set forth in this early report were that while in general good sanitary conditions prevailed upon the watershed, the esthetic quality of the water was impaired by drainage from marsh and farm lands and that accumulations of organic matter in the lake gave opportunity for multiplication of algae which cause tastes and odors. The further conclusion was made that possible dangerous contamination might occur from a certain cesspool on the watershed and from excretal matters from trains passing over the embankment of the D. & H. R. R. tracks at the foot of the lake. The report recommended that the village take steps to prevent drainage from the railroad and all other sources of contamination reaching the supply.

The report made in 1911 dealt chiefly with the sanitary conditions of the supply while the recent inspection concerned itself almost wholly with the present conditions which have been giving rise to turbidity, tastes and odors in the supply although it should be noted that the earlier report pointed out certain conditions which affected the esthetic quality of the supply.

The public water supply of Saratoga Springs is derived from Loughberry lake, immediately northeast of the village. The water is delivered to the village by pumping directly to the mains and at present the daily consumption is probably between two and three million gallons. The intake is located about 150 or 200 feet from the dam across the southern end of the lake and at a point where the water is 20 feet deep. The end of the intake pipe is stated to be about 12 feet below the surface and the pipe itself is carried to the shore on timber trestles a few feet above the bottom of the lake. The intake consists of a timber crib about 10 feet square. The water is screened through ½-inch mesh screen. On the shore near the pumping station is located a small pump well approximately 20 ft. long, 5 ft. wide and 9 ft. deep below water level.

Loughberry lake has an area of about 80 acres and a maximum depth of about 20 feet. Its capacity may be roughly estimated at 175,000,000 gallons. Its drainage area is about 7 square miles. This area is for the most part a fairly level sandy plain devoted to agriculture and with a comparatively small resident population. The majority of houses are well back from the streams tributary to the lake and the chief sources of pollution appear to be surface wash from one or two barnyards and cultivated fields. Another source of pollution, however, is from fishing upon the reservoir, the privilege being received through permits which may be obtained by anyone from the Board of Water and Sewer Commissioners. This privilege is freely taken advantage of.

When the lake level was raised by the construction of the dam a considerable low marshy area was flooded and apparently no effort was made to clear this land of organic matter. The trees were cut down but the stumps and roots were left. In addition to organic matter thus left when the reservoir capacity was increased the tributary streams are constantly bringing fresh quantities of vegetable matter from the swamps and farm lands through which they flow. At the head of the lake in shallow water organic deposits are present at least a foot in depth and that decomposition processes are going on is evidenced by the evolution of gas bubbles.

At the time of the inspection the water of the lake was a brownish green and had a distinct vegetable odor. The taste of the water might be described as musty vegetable. Water drawn in bath tubs and swimming pools in the village had a brownish turbid appearance sufficiently pronounced to make it objectionable for bathing or laundry purposes. Upon standing in a swimming pool for about a day the color of the water changed from brown to black. It is stated that the worst trouble was experienced at the points in the distribution system farthest from the pumping station. It is also stated that high turbidity is usually noticed after fires in the village.

Trouble has been experienced in the past with tastes and odors due to algae growths in the reservoir and this year the village authorities sought the advice of an expert relative to the steps necessary to protect the supply from a recurrence of this trouble and under his instructions the lake has been treated with copper sulphate. This chemical has been applied four different times this summer, about 400 lbs. being applied each time. So far as can be determined the application was thorough, the chemical being placed in canvas sacks and dissolved by towing behind a boat rowed over the entire lake. With the estimated capacity of the lake as 175,000,000 gallons the proportion of copper sulphate applied each time would have been about one part in 3,800,000. The applications took place on the following dates: June 3, June 25, July 17 and August 7. It is stated that there had been no appearance of algae in the lake in the spring of this year. The first trouble with tastes and odors is said to have occurred about July 17 when the lake appeared to be "working". By August 7 the "working" of the lake was very apparent and tastes and odors became more pronounced, this condition becoming more acute as time went on.

Previous to the week of the inspection there had been little rain in the vicinity for some time and the level of the lake had lowered quite appreciably. The decreased rainfall induced stagnation, increased the proportion of ground water in the supply and, in conjunction with the large amount of organic matter and warm sunshiny weather, afforded excellent opportunity for the multiplication of algae growths and the decomposition of dead algae and other vegetable organisms.

At the time of the recent inspection, samples for analyses were taken from the lake and from a tap in the village and the results of the analyses of these samples together with the results of analyses of samples taken since the inspection in 1911 are given in an appended table. These analyses show a water with varying amounts of color, frequent high turbidity and fairly noticeable odors. The figures for free and albuminoid ammonia are fairly high indicating the presence of decomposing and decomposable organic matter. Nitrites and nitrates are low. The figures for oxygen consumed are variable and those obtained at the time of the recent inspection are very high indicating the presence of considerable quantities of carbonaceous matter. The chlorine figures are variable and range from normal to twice normal. The hardness is quite high and is mostly temporary. The bacterial counts are moderate to high and the presence of organisms of the B. coli type indicates at times active contamination. The very high counts in the samples taken in the lake on August 15, 1914, are probably due to water bacteria which were finding ample food supply in the organic matter present. The increase in iron in the tap water over that in the lake water is significant and suggests possible corrosion of the water mains.

The problem presented by this case is one involving so many possible factors that it is impossible to give definite conclusions as to the cause of the trouble based on a single inspection and a few analyses. This is a matter which can only be determined by an extended series of observations and numerous physical, chemical, bacteriological and microscopical analyses. Such observations and analyses require a great deal of time and can best be made by the expert employed by the village. However, with the limited data available in this particular case, but with a general knowledge of somewhat similar troubles elsewhere, a number of possible causes of the trouble suggest themselves, as follows:

(a) Algae growths which have persisted in spite of the copper sulphate treatment.

(b) Decomposition of organic matter derived from these growths and other sources.

(c) Precipitation of iron normally held in solution in the water or dissolved from the water mains as the result of the increase of free carbon dioxide derived from springs in the bottom of the lake.

(d) Blackening of the water upon standing may be due to the formation of some tannate of iron due to the union of dissolved iron with humic acid. It is also possible that hydrogen sulphite, formed by the decomposition of organic matters, may have formed black sulphide of iron.

(e) Insufficient flushing of water mains may also have had an effect upon the turbidity by allowing accumulations of sediment which becomes stirred up at times of heavy draught.

(f) The trouble may be due to a combination of all five of the possible causes described above.

There is a further possibility, which however seems somewhat remote, that a break has occurred between the intake crib and suction well thus introducing a quantity of sediment into the mains, or that the end of the intake pipe has been partly covered with mud from silting. This is a condition which cannot be determined without shutting down the pumping plant or

RESULTS OF WATER ANALYSES

Abbreviations used to describe odors of water: 0, none; 1, very faint; 2, faint; 3, distinct; 4, decided; 5, strong; 6, very strong; a, aromatic; d, disagreeable; e, earthy; f, fishy; g, grassy; m, musty; v, vegetable

Municipality	County	Source of sample	Date of collection	PHYSICAL				CHEMICAL (PARTS PER MILLION)											BACTERIOLOGICAL			
						ODOR		SOLIDS			NITROGEN AS —						HARDNESS			B. COLI TYPE + = PRESENT — = ABSENT		
				Color	Turbidity	Cold	Hot	Total	Loss on ignition	Mineral residue	Free ammonia	Albuminoid ammonia	Nitrites	Nitrates	Oxygen consumed	Chlorine	Total	Alkalinity	Bacteria per c. c. gelatin 20° 48 hours	10 c.c.	1 c.c.	1-10 c.c.
Saratoga Sp'gs.	Saratoga......	Tap, public supply..........	10/ 6/11	10	5	....	....	85	10	75	.008	.104	.001	0.06	1.10	1.12	68.6	67.0	140	—	—	—
Saratoga Sp'gs.	Saratoga......	Tap, public supply..........	4/25/12	20	5	....	....	68	11	54	.008	.066	.001	0.10	2.10	1.00	42.9	42.0	120	+	—	—
Saratoga Sp'gs.	Saratoga......	Tap, public supply..........	2/13/13	7	Tr.	1 v.	1 v.	107	....	....	.034	.050	Tr.	0.16	1.50	1.25	74.3	74.0	160	—	—	—
Saratoga Sp'gs.	Saratoga......	Tap, public supply..........	5/14/13	10	1	2 a.	2 a.	93	....	....	.012	.090	.003	0.06	3.00	0.75	61.4	58.0	325	—	—	—
Saratoga Sp'gs.	Saratoga......	Tap, public supply..........	6/17/13	5	20	3 a.	3 a.	98	....	....	.016	.150	.001	0.04	3.60	1.00	64.3	64.0	1,500	+	—	—
Saratoga Sp'gs.	Saratoga......	Tap, public supply..........	12/19/13	15	3	3 a.	3 a.	88	11	77	.014	.114	.001	0.02	3.00	1.50	71.4	72.0	45	—	—	—
Saratoga Sp'gs.	Saratoga......	Loughberry lake, near crib intake..................	8/15/14	5	10	....	....	95	21	74	.004	.100	.001	0.04	6.50	0.75	70.0	70.0	3,400	*+	*+	‡—
Saratoga Sp'gs.	Saratoga......	Tap, public supply..........	8/15/14	25	†25	....	....	98	20	78	.004	.136	.002	0.04	4.20	0.75	76.0	78.6	60	*+	*+	§—
Saratoga Sp'gs.	Saratoga......	Loughberry lake, north end, near inlet stream.........	8/15/14	....	....	....	....	....	....	....	....	....	....	....	....	**	......	......	95,000	*+	*+	*+

* Presumptive test, gas formed. † Reddish precipitate. ‡ Iron, 0.2. § Iron, 0.6. ** Estimated.

by employing a diver. It does not appear, in view of the existing arrangement of the plant, that the application of alum followed by sedimentation would be practicable or bring about any marked improvement in the quality of the water.

Pending permanent improvements to the supply, the following measures for the alleviation of the present conditions are recommended:

1. That the village authorities submit this problem to their expert for further study and investigation.
2. That it might be found advisable to increase the dose of copper sulphate which has previously been rather small. This should be done under the supervision of their expert.
3. That the village authorities make a careful investigation of the condition of the intake pipe in order to determine the possibility of a break or the occurrence of sediment around the intake end.
4. That the water mains throughout the village be given a thorough flushing in order to remove any possible accumulations of sediment.

In view of the unsatisfactory analytical results, the various opportunities for serious contamination, the decidedly unsatisfactory esthetic quality at times and the conditions in the lake on the watershed and in the character of the water itself, all of which would be most difficult to remedy, it is questionable whether a permanent improvement to the supply can be obtained within the limits of a reasonable cost. It is therefore recommended that this question be referred to an expert, employed by the village, for further study and investigation. This study should consider the advisability of abandoning the present supply and securing a new and perfectly satisfactory supply elsewhere or else apply such improvements to the present supply as to render it satisfactory at all times and under all conditions.

ALBANY, N. Y., *August* 24, 1914

This report was submitted to the Board of Water Commissioners in person by Linsly R. Williams, M. D., deputy commissioner.

SARATOGA SPRINGS

(Mineral Springs, State Reservation Commission)

An inspection of the mineral springs at Saratoga Springs which are under the control of the New York State Reservation Commission was made on August 20 and 25 inclusive, by Mr. E. S. Chase, assistant engineer in this Department. A great deal of information and assistance was given the assistant engineer by Dr. A. W. Ferris, medical superintendent for the Reservation Commission.

As the inspection was necessarily brief, it seems advisable to present the principal data in connection with the various springs in the form of a table, which may be found appended. General and specific information in regard to the history, geology and development of the Saratoga Mineral Springs is published in detail in Bulletins 159 and 169 of the New York State Museum, in the report of the Commissioners of the New York State Reservation at Saratoga Springs for the years 1910 to 1914 inclusive and in Bulletin No. 91, Bureau of Chemistry, United States Department of Agriculture.

There are in all 22 mineral springs from which water was flowing at the time of the inspection and which are under the control of the Commission. Six of these springs are leased to private individuals, the waters from which are bottled and put on the market for public consumption. These springs are the Adams, Coesa, Geyser, Hathorn No. 1, Hathorn No. 2, and Minnonebe. About eleven of the springs are easily accessible to the public and are used to a considerable extent during the summer season by the public for drinking purposes. Two of the springs are used exclusively for bathing purposes and two others are used partly for bathing. Nine springs, although flowing, have practically no use at present. Of the springs used for drinking purposes, four are located in the heart of the village, namely, the Emperor, Hathorn No. 1, Congress No. 2 and Columbian. Two others used for bathing only are located in the village while the remainder are located in Geyser Park two or three miles south of the village. The exact locations of the various springs are indicated on the maps accompanying the reports of the Reservation Commission. In the past there have been a great many more springs which have been in use but the Commission has acquired the mineral rights of these springs and has capped them and put them out of service.

At the time of the inspection samples for bacteriological examination were taken from those springs in the village which are used for drinking purposes and also one sample from a fresh water spring in Canfield Park used to a great extent by the public. Results of the analyses of these samples together with others made in the past by the Division of Laboratories and Research are given in an appended table. The location of the springs in Geyser Park is such that there seems to be practically no danger of any contamination and it was not deemed necessary to collect samples from those sources.

With the exception of the result of the analysis of the sample from Congress No. 2, the results obtained are satisfactory with respect to the bacterial contents of the mineral spring waters. The total number of bacteria is low and organisms of the B. coli type are absent in the 30 c.c. samples tested. In the case of the Congress No. 2, the total number of bacteria is very high and B. coli are present in one of the three 10 c.c. inoculations. The recent analysis of the fresh water spring is also somewhat unsatisfactory as is also the case with several of the analyses made of it in the past. The Congress No. 2 spring is being used only temporarily and may not be used after the present season. It is not clear as to the exact source of the active contamination which appears to be present in this spring water. The spring is located in Congress Park in the heart of the village and it may be that some surface water is finding its way down along the casing. This spring does not flow naturally but is pumped into the bowl at the pavilion in order to make it accessible to the public. It is possible that a leak exists in the suction line to this pump and contaminated subsurface water enters and mixes with the spring water. Little information is obtainable in respect to the depth of the Canfield fresh water spring but it is probable that it does not come from any great depth and, therefore, is liable to be contaminated by surface water, located as it is in a densely populated village.

Another group of mineral springs is located in the village of Ballston Spa, a few miles south of Saratoga Springs. These springs were not visited, but physical data in respect to them have been obtained by the Reservation Commission and this data in tabulated form may be found appended.

The mineral springs of the Reservation Commission seem to be subject to few, if any, sources of contamination save those springs which are located in the center of the village. Active contamination of the springs in the village may occur due to changes in the ground water flow, increases in intensity of the contamination of the subsurface water, breaking of the seals in the wells or corrosion and leaking of the piping. The contamination of the water from Congress No. 2 is evidence of this possibility.

It is, therefore, recommended that the use of the Congress No. 2 spring be abandoned and that careful watch be kept of the sanitary quality of the other springs by means of frequent and regular bacterial analyses.

ALBANY, N. Y., *November* 17, 1914

DATA REGARDING MINERAL SPRINGS UNDER CONTROL OF THE STATE RESERVATION COMMISSION AT SARATOGA

(Springs flowing August, 1914)

SPRINGS	Depth, feet	Distance to rock	Casing	Inner tube	Flow, 9 P. M.	Sealed	June 25, 1914		Use *	Remarks
							Cl. p. p. m.	Ca Co₃ p. p. m.		
Adams	344.5	......	6″	197′ 2″ cu	Pump.	197′	4,000	3,325	D., Bo	
Alnoba	......	0	6″	103′ 1¼″ Cu	......	103′	......	....	....	
Awasa (Pandora)	......	......	6″	233′ 1¼″ Fe	......	233′	525	1,030	D	
Champion No. 1	313	......	6″	288′ 1¼″ Fe	......	** 16′, 288′	635	1,170	....	
Champion No. 2	......	0	6″	153′ 1¼ Fe	......	153′	......	....	....	
Cocsa	......	......	6″	1¼″ Fe	......	....	3,750	3,075	D., Bo	
Columbian	11	11	Concrete	well.	Pump.	....	230	850	D	
Congress No. 2	257	18′	6″	58′ 1¼″ Fe	Pump.	58′	1,040	1,600	D	Temporary use.
Ditch well No. 2	30	......	6″	....	......	....	1,300	1,750	....	
Emperor	......	......	6″	113′ 1¼″ Fe	1	83½′, 113′	1,520	1,975	Bo., D	Water from T at 98′; 96′ ½″ pipe; inside 1¼″.
Flat well No. 2	......	......	6″	252′ 1¼″ Fe	......	252′	5,550	4,425	....	
Geyser	144	9′	6″	60′ 2½″ Cu	......	60′	1,300	2,775	D., Bo	60′; ¾″ Cu. tube; inside 2½″.
Hathorn No. 1	†	65′	‡	495′ 1¼″ Cu	Approx.6	495′	2,360	2,500	Bo., D	Pipe perforated at 400′. Strata at this point thought to have most gas.
Hathorn No. 2	......	23′	6″	1¼″ Fe	Approx.3	....	6,950	4,450	D., Bo	
Hathorn No. 3	......	......	6″	1¼″ Cu	......	....	6,050	4,100	D	
Island	......	......	6″	170′ 1¼″ Fe	......	170′	......	....	....	Spouts 30′.
Minnonebe	188′	......	6″	89′ 2″ Cu	Approx.1	89′	1,180	2,375	D., Bo	100′; ½″ Cu. tube; inside 2″ tube.
New High Rock	171′	Approx. 23′.	6″	43′ 1¼″ Fe	Pump.	43′	......	....	Ba	
Peerless	151	......	6″	118′ 1¼″ Fe	2	110′	1,560	2,075	Ba	
Pump well No. 4	......	......	6″	130′ 1¼″ Fe	......	130′	780	1,440	....	Spouts 20′.
Shonts No. 3	......	......	6″	197′ 1¼″ Fe	......	197′	3,200	3,950	....	
Zalama	......	0	6″	137′ 1¼″ Fe	......	137′	......	....	....	

Cu. = Copper Tube. Fe. = Iron Tube * = D for drinking; Bo=bottled; Ba=Baths. ** Rubber seal to prevent surface water flowing down.

† Bored to 1050′. Now about 700′. ‡ Rock bore 3″ & 6″

KEY TO MINERAL SPRINGS AT BALLSTON SPA

(State Reservation Commission)

	Twentieth Century	West's	Monarch	Mohican	Old Iron	Sans Souci	Hide Franklin	Washington	Artesian
Date	1908	....	1910	1911	Discovered 1767.	1874	1869	1869	1869
Depth	756′	About 600	No tubing runs in casing of Mohican.	260′	647′	700′	715′	600′	652′
Distance to rock	200′	....	....	80′	....	40′	34′	81′	....
Bore	6″	6″	....	6″	....	5″	6″	5″	6″
Casing	6″	6″	....	6″	....	5″	6″	5″	6″
Tubing	¾″ seedbag and tubing dropped into bore; bag was at 500′.	1″	1″ rubber seal at 42′.	1¼″ rubber seals.	....	1¼″ seal, 385; ¾″, 600′. No seal.	1½″ rubber seal, 350′	1¼″ seal, 52′; ¾″ seal, 252′.	1¼″ block, tin lined
Flow	Intermittent	....	5 (g)	....	1½	1	4	2¼	1
Temperature	....	....	11° C.	11° C.	10° C.	10.5° C.	11° C.	11° C.	11° C.
Pressure	No sample	No sample	....	22 lb.	....	60 lbs.	97 lbs.	....	....
Gas (supersaturation)	No sample	No sample	None	None	25%	29%	21%	30%	32%
Cl	....	....	170	190	740	3,600	7,050	7,250	7,400
NaCl	....	....	280	313	1,219	5,934	11,622	11,952	12,199
$CaCo_3$	....	....	640	620	1,200	3,175	5,110	4,800	4,550
			Flowing under Artesian head.				Hathorn No. 2	Cl.	6,850
								NaCl	11,293
								$CaCo_3$	4,475

June 30, 1914.

RESULTS OF WATER ANALYSES, STATE RESERVATION MINERAL SPRINGS, SARATOGA SPRINGS

Abbreviations used to describe odors of water: 0, none; 1, very faint; 2, faint; 3, distinct; 4, decided; 5, strong; 6, very strong; a, aromatic; d, disagreeable; e, earthy; f, fishy; g, grassy; m, musty; v, vegetable

SOURCE OF SAMPLE	Date of collection	BACTERIOLOGICAL			
		Bacteria per c.c. gelatin 20° 48 hours	B. COLI TYPE + = PRESENT — = ABSENT		
			10 c.c.	1 c.c.	1-10 c.c.
Emperor	4/24/12	32	—	—	—
Emperor	6/12/12	11	—	—	—
Hathorn No. 1	6/12/12	15	—	—	—
Hathorn No. 2	6/12/12	3	—	—	—
Hathorn No. 3	6/12/12	3	—	—	—
Coesa	6/12/12	1	—	—	—
Geyser	6/12/12	41	—	—	—
Magnetic	7/18/12	180	—	—	—
Ditch Well No. 2	9/19/12	47	—	—	—
Columbian	4/ 8/13	160	—	—	—
Hathorn No. 2	4/30/13	9	—	—	—
Fresh Water Spring, Canfield Park	6/17/13	750	1+2—	0+3—	0+3—
Minnonebe	7/10/13	2	—	—	—
Fresh Water Spring, Canfield Spring	10/ 8/13	25	—	—	—
Fresh Water Spring, Spring St. side	10/15/13	25	+	—	—

RESULTS OF WATER ANALYSES

Abbreviations used to describe odors of water: 0, none; 1, very faint; 2, faint; 3, distinct; 4, decided; 5, strong; 6, very strong; a, aromatic; d, disagreeable; e, earthy; f, fishy; g, grassy; m, musty; v, vegetable

		CHEMICAL (PARTS PER MILLION)									BACTERIOLOGICAL			
		NITROGEN AS —										B. COLI TYPE + = PRESENT — = ABSENT		
	Date of collection	Total	Mineral residue	Free ammonia	Albuminoid ammonia	Nitrites	Nitrates	Oxygen consumed	Chlorine	Hardness, alkalinity	Bacteria per c.c. gelatin 20° 48 hours	10 c.c.	1 c.c.	1-10 c.c.
Emperor Spring	8/25/14	....	....	....	....	....	....	....	....	....	2	0+3—	0+3—	0+3—
Hathorn No. 1	8/25/14	....	....	....	....	....	....	....	....	....	2	0+3—	0+3—	0+3—
Congress No. 2	8/25/14	....	....	....	....	....	....	....	....	....	9,500	1+2—	0+2—	0+3—
Columbian	8/25/14	1,218	1,100	1.70	1,004	.001	0.02	2.40	240.0	840.0	2	0+3—	0+3—	0+3—
Canfield fresh water spring	8/25/14	....	....	....	....	....	....	....	....	....	100	1+2—	0+3—	0+3—

A copy of the above report was transmitted to the State Reservation Commission.

SARATOGA SPRINGS

(Proprietary Mineral Springs)

An inspection of the Excelsior, Quevic, Arondack, Vichy and Moriarta mineral springs at Saratoga Springs was made in connection with a general inspection of all the mineral springs in the vicinity of Saratoga which was made on August 20 to 25, 1914, inclusive, by Mr. E. S. Chase, assistant engineer in this Department. In view of the fact that these five springs are under private exploitation while the other mineral springs are controlled by the State Reservation Commission, the results of the inspection of the privately owned springs will be reported upon separately.

These springs, with the exception of the Moriarta, have been inspected previously by Mr. Wachter of the Division of Laboratories. General reports of investigations of the mineral springs at Saratoga made by this Department in 1909 and 1910 may be found in the annual reports for those years, pages 317 and 373 respectively.

The Excelsior and Quevic springs are located about 1½ miles northeast of the center of the village in the valley of and near a brook which drains eventually into Saratoga lake. These springs are owned and exploited by C. W. Lawrence. The Excelsior spring has long been used but the Quevic is a more recent development. An older spring at this place is also named Quevic, but its use has been discontinued on account of the inability to obtain a clear water from it suitable for bottling.

The water from the Excelsior spring is used for bottling and is sold to a considerable extent in barrels. As the water of this spring is thought to be comparatively weak in regard to mineral constituents and somewhat deficient naturally in free carbon dioxide a certain amount of sodium chloride and additional carbon dioxide are added before bottling and barreling.

The Excelsior spring is said to be 56 feet deep, the bottom 10 feet being in rock. The casing of this spring is of wood with an inside diameter of 18 inches. A small pavilion has been built over the spring and the casing projects a few inches above the floor. The top of this casing is uncovered. About 12 feet below the ground a block tin pipe runs from the spring to a pit underneath the bottling house. In this pit the water flowing through the pipe from the well is run into barrels lined with block tin. The barrels thus filled receive additional salt, are charged with carbon dioxide and then sealed. This water when bottled is taken directly from these barrels. The exact yield of the spring is unknown, but the maximum yield is estimated at about 40 barrels per day or 1.2 gallons per minute. It is stated that since the regulation of pumping from other springs the yield of this spring has been appreciably greater.

The Quevic spring supplies the water used in the manufacture of soft drinks, root beer, ginger ale, etc. The water from this spring is also artificially carbonated and a small quantity of sodium chloride and bicarbonate of soda added. This water is sold carbonated in barrels and bottles and is also sold without being carbonated.

The Quevic spring is a fresh water spring located about 300 feet southwest of the bottling works at the foot of a steep gravel bank. A line of tile has been laid extending into the gravel bank 10 or 15 feet and the spring water collected by this tile flows into a concrete well about 4 x 4 x 6 feet deep. Over this well is a tightly fitting wooden cover and the side walls project about 18 inches above the surface of the ground.

The sanitary conditions in respect to the location of these two springs seem comparatively good. The bottling works are about 50 feet west of the Excelsior spring and the sewer from the works is at its nearest point about 75 feet from the spring but extends northward and is said to discharge into the village sewer. The stream, which flows through the property and which drains eventually into Saratoga lake, is about 150 feet from the spring. This brook rises in the village and is undoubtedly contaminated to some extent by surface wash. It does not seem probable, however, that this stream would affect the sanitary quality of the spring. It is possible, however, that should leaks occur in the sewer from the bottling works there might be danger of some contamination of the spring from that source and it would seem advisable to reconstruct this sewer for at least 150 feet from the spring, making it of cast-iron with tight joints instead of terra cotta.

The Quevic spring seems fairly well removed from possible contamination. There are no houses on top of the gravel bank within one-quarter mile. West of the spring and on somewhat lower ground there is a dwelling house. The privy of this house is about 100 feet from the spring and, although the slope is away from the spring toward the privy, it would seem advisable, if only for esthetic reasons, to place this privy on the other side of the house still further distant from the spring.

At the time of this inspection samples of the water from these springs were collected and the results of the analyses of which, made by the Division of Laboratories and Research, may be found in the appended table. The analysis of the Excelsior water would indicate from the chlorine value that the addition of salt to this water is unnecessary if this sample was natural spring water as claimed. The bacterial count is very low and the absence of organisms of the B. coli type indicates the comparative freedom from active contamination. The analysis of the Quevic water shows a fresh water of fair sanitary quality, although the presence of organisms of the B. coli type in two of three 10 c. c. inoculations indicates the occurrence of a certain amount of active contamination. The source of this active contamination does not seem clear although surface water may reach the spring in an imperfectly purified state after heavy rains and such rains had taken place on days previous to the collection of the samples. The increased number in the sample from the bottling machine may be due to carelessness in manipulation or simply natural increase due to storage of a ground water in the light.

The Arondack spring is located about two miles southwest of the village center on the bank of a small pond just outside Geyser Park of the State Reservation Commission. This spring is owned and exploited by the Arondack Spring Company, of which Mr. J. F. Halla is president. At the time of the inspection there was no visible evidence of the existence of such a mineral spring. When the superintendent was requested to indicate the location of the spring he pointed to a spot in the floor of the bottling room and stated that the spring was underneath the floor. There was no trap door at that spot and the flooring was nailed firmly. It was stated that a small pump at one side of the room was used to pump this spring water, but although the spring was visited on three different days on none of these days was this pump in operation and the men in charge refused to start the pump. As far as this inspection goes there is absolutely no evidence of the existence of such a mineral spring save the statements of the employes of the spring company.

In addition to exploiting the alleged Arondack mineral water, this company also prepares and bottles soft drinks, such as ginger ale, etc. The water for this purpose is derived from a fresh water well located back of the bottling works. This spring is about 50 feet in the rear of the works and about 75 feet from the edge of the small pond. The spring water enters at the bottom of a concrete well about 6 feet square and 3 or 4 feet deep. This well is covered by a wooden roof and the side walls extend a few inches above the surface of the ground. The sanitary surroundings of the spring seem satisfactory. A privy is located about 125 feet north of the spring but on ground sloping away from the spring. About 400 feet east of the spring there is an abrupt banking rising about 15 feet. On top of this bank there are two stables but it is said that only one horse is kept.

Water from this fresh water spring is said to be pumped into a large wooden tank in the upper part of the building and from this tank the water is discharged, as required, into two galvanized iron cylindrical tanks on the second floor of the building. From the galvanized iron tanks the water is conducted to the ground floor, where it passes first through the cooling apparatus, then through the carbonating machine and then to the bottles

The syrups for the soft drinks are added automatically at this bottling machine and it does not appear that the intermediate iron tanks are essential for the manufacture of the soft drinks.

The water from the alleged mineral spring is said to be pumped directly nto the galvanized tanks, thence to the coolers, carbonating machines and bottles. This is according to the statements of the men in charge at the spring and may be taken for what it is worth. At no time on any of the three days that the assistant engineer was at the spring was there anything available to draw into these tanks but fresh water. In a room beyond that n which the iron tanks were located two galvanized iron pails were noticed. Over these pails were felt filter cones and from the pails attached to faucets at the bottom of the pails were lengths of rubber hose leading to the iron tanks. This indicates the ease and possibility of solutions of salts being made up, strained and run into the galvanized iron tanks, and mixed with fresh water, thus producing an artificial mineral water. However, the actual carrying out of such a method was not observed. It should also be noted that there is only one set of faucets over the iron tanks through which the water can be discharged into them and the fresh and the alleged mineral spring waters have to enter through the same pipes. Arrangements were said to exist allowing the changing from one source to the other, but actual demonstration of this was refused by the men in charge of the works.

At the time of the inspection samples were taken from the fresh water spring and the results of the analyses will be found in the appended table. These results indicate a water of fair sanitary quality although organisms of the B. coli type were present in one of the three 10 c.c. inoculations. On account of the shallowness of this spring it seems probable that a certain amount of imperfectly purified surface water reaches it, especially after heavy rains, and such rains had occurred two days previous to the collection of the sample.

The Vichy spring is located a few hundred feet west of the Arondack spring on the opposite side of the small pond. This spring is exploited to a considerable degree by the Saratoga Vichy Spring Company and has a large sale. The same company also prepares and bottles soft drinks, especially ginger ale. The water for the soft drinks is obtained from a fresh water well while the mineral water, it is claimed, is derived from the mineral spring.

The mineral spring is said to be located underneath the bottling works near the entrance to the building. At this point an iron pipe about 3 inches in diameter extends from the floor up through the ceiling and is connected to the suction end of a small plunger pump belted to an electric motor. This vertical pipe is said to extend into the casing of the mineral spring underneath the floor. The chief function of this pump seemed to be the supplying of a glass bowl from which water could be served to visitors. The discharge pipe of the pump has two branches, one of which supplied the glass bowl and the other leads to a concrete tank in the extreme western end of the building. Another pump, steam driven and located on the ground floor, is said to pump also from the mineral spring but at the time of the inspection this pump was not operating.

The bottling house for the soft drinks is located about 200 feet west of the main building on a small knoll. The well supplying fresh water for the manufacture of soft drinks is located a few feet northeast of this house. This well is said to be an ordinary 2-inch driven well, about 30 feet into gravel. The exact location of this well could not be determined, as its top is covered over with soil. However, judged from its approximate location it would seem that its sanitary surroundings are fairly good. A sewer for waste water from the bottling house probably runs somewhat nearer the well than could be considered desirable. The water from the well is pumped to a concrete tank in the second floor of the house and from there it can be drawn off to the carbonating and bottling machines.

A third well is located about 75 feet southwest of the soft drink building and it is claimed that the water from this well is used for bottle washing and similar purposes. This well is said to be quite deep and the sanitary surroundings seem to be good. The top of the well is covered by a small wooden building, the door of which is kept locked. On the 24th of August, when the Vichy spring was visited for the purpose of taking samples, an electrically driven pump was heard operating inside of the small building. When a request was made of the foreman at the mineral water bottling works to indicate a point at which a sample of water from this well could be taken he denied that the water from this well was being received at the bottling works. Upon being confronted with the fact that a pump was operating at the well, he stated that the water was being run to waste. Thereupon he was requested to point out the place at which this waste took place. After a little delay and hesitation he led the assistant engineer to the concrete tank at the western end of the building, noted previously in connection with the mineral spring. Water was entering this tank from an iron pipe located above one end of the tank. Before discharged into the tank the water had passed through a felt and filter paper filter. Questions as to the use of this water were asked of the foreman, who denied, with some show of irritation, that it was used for bottling. From the fact, however, that he had tried to conceal the receipt of this water at the bottling works, that the water was filtered, and that several pipes led from this tank joining the rather complex system of piping in the building, there seemed to be grounds for the suspicion that this water could be used for mineralization, carbonation and bottling. It must be noted, however, that this conclusion is only a suspicion and was not confirmed by actual observations.

In addition to the alleged mineral spring and the two fresh water wells, there is a pit in the floor of the bottling works which is said to receive water from a spring located in the gravel bank west of the building. The water collected in this pit is said to be used only for boiler feed and bottle washing. A slight inflow of water was noticed entering this pit from a small conduit under the floor. Numerous pipes led from the pit and connected with the piping system extending through the building.

Samples were taken of the four different waters at the Vichy spring and their analyses may be found in the appended table. The mineralization of the alleged mineral spring water is decidedly less than that shown by published analyses, the chlorine expressed as sodium chloride being but 740 p.p.m. compared with 1911.6 given in the published analyses. The bacteriological results are satisfactory, being low in total numbers and with no organisms of the B. coli type present. The analysis of the fresh water used for soft drinks indicates a fairly satisfactory sanitary quality, although the nitrates are high and indicate considerable past contamination well purified by passage through the soil. The bacterial results obtained from the examination of the pit water at the bottling works show very high total numbers of bacteria and B. coli in 10 c.c. samples. The surroundings of this pit are such that dust and dirt may easily reach the water. The analysis of the fresh water received in the tank at the bottling works after passing through the filter shows a fairly satisfactory water, although high in free ammonia and total numbers of bacteria.

Another mineral spring, exploited by the Saratoga Vichy Company and known as the Moriarta spring, is located on property adjoining that of the Lincoln spring on South Broadway about one mile south of the village center. This spring is a drilled well, said to be over 200 feet deep, from which the water is pumped to the bottling works by a deep well pump. Practically no information could be obtained regarding this well at either the bottling house or at the office of the Saratoga Vichy Company. The spring has been exploited within the past year or two only and it seems probable that it is a genuine mineral spring, although not particularly strong in saline contents. The location is in a gravel and sand plain and the sanitary surroundings seem to be satisfactory. A single bacteriological analysis shows very few bacteria and none of the B. coli type in 30 c.c.

SUMMARY AND CONCLUSIONS

The Excelsior and Quevic spring waters, it is freely admitted by the management, are artificially treated, the former by the addition of carbon dioxide and salt and the latter by the addition of carbon dioxide, salt and bicarbonate *of soda*. From a sanitary view point these springs should give a satisfactory

RESULTS OF WATER ANALYSES

Abbreviations used to describe odors of water: 0, none; 1, very faint; 2, faint; 3, distinct; 4, decided; 5, strong; 6, very strong; a, aromatic; d, disagreeable; e, earthy; f, fishy; g, grassy; m, musty; v, vegetable

SOURCE OF SAMPLE, PRIVATELY EXPLOITED SPRINGS, SARATOGA SPRINGS	Date of collection	PHYSICAL		CHEMICAL (PARTS PER MILLION)										BACTERIOLOGICAL			
				SOLIDS		NITROGEN AS						HARDNESS			B. COLI TYPE + = PRESENT — = ABSENT		
		Color	Turbidity	Total	Mineral residue	Free ammonia	Albuminoid ammonia	Nitrites	Nitrates	Oxygen consumed	Chlorine	Total	Alkalinity	Bacteria per c.c. Gelatin 20° 48 Hours	10 c.c.	1 c.c.	1-10 c.c.
Excelsior spring	8/24/14	......	......	8,220	5,820	10.24	.004	.003	0.02	8.50	3,587.5	......	2,240	10	0+3—	0+3—	0+3—
Quevic spring (tap)	8/24/14	Tr.	Cl.	160	148	.006	.006	.003	0.02	0.30	1.75	122.8	121.0	60	2+1—	0+3—	0+3—
Quevic spring (bottling machine)	8/24/14	......	......	......	......	......	......	......	......	......	......	......	......	3,600	1+2—	0+3—	0+3—
Arondack spring (overfilow pipe of fresh water spring)	8/24/14	Tr.	Cl.	161	140	.004	.004	.001	0.16	0.20	15.75	100.0	93.0	95	1+2—	0+3—	0+3—
Arondack spring (tap) from storage tank, (origin uncertain probably fresh water)	8/24/14	......	......	......	......	......	......	......	......	......	......	......	......	480	1+2—	0+3—	0+3—
Vichy spring (at bowl)	8/24/14	......	......	2,372	1,732	9.50	.004	.001	Tr.	5.60	450.0	......	1630.0	......	......	......	......
Vichy spring (outlet of pump)	8/24/14	......	......	......	......	......	......	......	......	......	......	......	......	2	0+3—	0+3—	0+3—
Vichy spring (soft drink well)	8/24/14	Tr.	Cl.	154	132	.004	.004	.001	1.60	0.10	1.25	120.0	117.0	6	0+3—	0+3—	0+3—
Vichy spring (wash water and boiler feed) from pit	8/24/14	......	......	......	......	......	......	......	......	......	......	......	......	3,200	3+0—	0+3—	0+3—
Vichy spring (fresh water well, received in tanks)	8/24/14	Tr.	Tr.	255	236	.528	.004	.001	Tr.	0.20	3.75	214.5	211.0	1,900	0+3—	0+3—	0+3—
Moriarta spring	8/24/14	......	......	......	......	......	......	......	......	......	......	......	......	4	0+3—	0+3—	0+3—

water, although, of course, some contamination may be received during the bottling process.

The Arondack spring water is probably a purely artificial mineral water. This is evidenced by the failure of the employes at this spring to show any satisfactory proof of the use or existence of any true mineral spring. Further evidence of the artificial character of this alleged mineral water is shown by the existence of a system of piping, tanks and other appliances whereby the addition of chemicals to the fresh water can easily take place.

It seems probable that an actual mineral spring exists or has existed at the Vichy spring, but that for some reason, as the failure of the spring to produce sufficient quantity or proper quality, its use for bottling purposes has been abandoned either wholly or in part. The attitude of the foreman at the plant and the existence of the complicated system of pipes, pumps, tanks and valves which would allow the use of artificially mineralized and carbonated fresh water indicate that such artificial treatment may take place.

On the whole it may be said that the various sources of the privately exploited mineral water seem to be such as to produce reasonably safe and sanitary waters provided the wells are properly developed and maintained and provided sanitary methods of bottling are employed. The possible artificiality of these mineral waters is chiefly a medical and economic rather than an engineering problem, and it would seem that this matter could best be dealt with by the State Reservation Commission.

ALBANY, N. Y., *November* 17, 1914

Copies of the above report were transmitted to Mr. Isaac Vrooman, Albany, N. Y., and to the State Reservation Commission.

SARATOGA SPRINGS

Fresh Water Spring, State Reservation Commission

The following brief report was prepared of my inspection of one of the springs at Saratoga Springs which the State Reservation Commission contemplates developing for bottled water purposes and concerning which they asked the advice of this Department with special reference to the sanitary quality and the methods which they propose in the development of the spring.

I accordingly visited Saratoga Springs on November 19, 1914, and in company with Professor Anthony inspected the spring, looked over the ground, and listened to the method of development which they proposed. I also visited the office of the Commission, looked over plans, analytical work and other data and asked many questions as to details.

It appears that the spring which it is proposed to develop is one of a series of springs so-called, which issue from the side banks of a deep and narrow and short ravine which opens into the valley of Coesa creek about two miles south, and in a somewhat sparsely settled portion of the village. This small ravine runs in a southerly direction and cuts deeply into the small plateau south of the village which slopes to Coesa creek. The ravine is deep and the sides precipitous, and, cutting as it does deeply into the plateau at this point, the ground water flow is encountered in such a manner as to produce a number of freely flowing springs, the waters of which converge and form a relatively large stream of water tributary to Coesa creek, with which it unites a short distance below. In the short length of this ravine a very large volume of water quickly accumulates as a result of these springs, and one of these the Reservation Commission has decided to develop and place upon the market as a table water. The analyses correspond in a general way with the well-known Poland spring water, and the Reservation Commission has in mind the development of this water in the same manner as the Poland water has been developed.

In the development of the spring in question the Commission has in mind the sinking of a well shaft directly over this spring, the location of which is some five or eight feet from the stream, the shaft lining to be of polished granite masonry. The well is to be some six feet in diameter surmounted with a glass dome so that visitors may observe the enclosed spring and the operation of the pump which is also designed to be located there,— the pump and the connections to be of glass. From the spring a tin lined pipe will be laid to the bottling plant which will be located on the plateau above the ravine at a distance of some 100 to 200 feet from the spring.

The bottling plant will be housed in a modern artistic building, divided into a number of rooms in which will be located an office for administration, an observation lobby for visitors, a room for the glass storage tank into which the spring water will be pumped and from which it will be led to bottling apparatus, and a room for washing and sterilizing bottles. The details of this building are being worked out by the chief engineer of the Reservation Commission, Professor Anthony, in cooperation with the State Architect.

It is obvious on the face of it that the proposition insofar as it will bring in close proximity to the spring a considerable number of visitors, as well as employes of the establishment, is one not strictly in harmony with the best sanitary requirements or conducive to the highest purity of the water. The desideratum for a good bottled water is among other things that it shall be free from pollution of any kind and show no test for B. Coli. There is some question therefore whether it will be possible to so develop this spring as to entirely protect it from the incidental and accidental surface contamination that may occur from the nearby bottling establishment and will occur from the visitors who frequent the place to see the spring and its operations. In fact, the greater the reputation that may be gained for this bottled water, the greater will be the number of people who gather to see this spring and the greater the incidental, accidental or even wilful contamination that may occur on the ground at this point.

It hardly needs explanation that the presence of people around a spring, or in fact on any piece of ground, will lead to Colon contamination of the surface of the soil. These Colon bacteria are upon the hands, bodies and clothes and particularly upon the shoes of pedestrians; and it is clear that many of these bacteria will be readily transferred to the surface of the ground, where during and following rain, surface wash will carry them over and into the soil. The only security against the transference of these bacteria to the ground water below and to the spring itself will therefore be the efficiency of purification of the soil through which the surface water will pass and the tightness and integrity of the construction of the walls and structures adjacent to the spring.

Furthermore if it is proposed to place the glass pump in the spring compartment it will be necessary at times for employes to enter this compartment and handle the pump. Their presence under such conditions will also conduce toward contamination of the spring water unless the utmost precautions are observed. In fact there is some doubt whether it is possible to take such precautions as will entirely eliminate contamination from this source, and this raises a question at once as to whether it will not be better to place the glass pump in another compartment entirely separate from the spring; leaving the glass suction pipe in the spring compartment where it would presumably rarely if ever have to be touched.

Again there is the question of disposal of sewage from the lavatory and closets located in the bottling establishment, which is to be located a short distance from, and somewhat above, the spring on the same drainage area. Under these conditions pollution might occur unless the greatest precautions are taken in the installation and supervision of lavatory and toilets in this building and of the sewers leading from them.

Finally attention should be called to the possible contamination of the soil in underground flow from the building located on the road some few hundred feet from this spring. This building is not on the Reservation property and is probably provided with a privy or cesspool, if I recall correctly, and had a barn or stable connected with it. All these structures undoubtedly give rise to contamination of the soil, and there is some question as to whether this contamination will be entirely removed by percolation through the soil to the spring. It is possible that this house is not on the direct line of drainage toward the spring but if pumping from the spring is resorted to it is possible that the pollution may fall within the zone of depression of the spring thus induced and be drawn toward it. The security in this case would depend upon the efficiency of purification that takes place, i. e. percolation through the soil.

There is little question but that the ideal requirements of a spring of this character are an isolated location with reference to permanent sources of contamination and freedom from access of persons or animals to the vicinity of the spring. In other words if a spring be found unpolluted at its source then it is obviously possible to prevent any contamination from the various incidental and accidental sources referred to above by preventing access of persons and animals. If, however, the source of the spring in question is uncontaminated, and this can only be assumed at this time in absence of definite information, and further, that it will be possible to protect it against contamination under the conditions which the Reservation Commission proposes, it is obvious that a number of very careful precautions should be taken by the Commission; and I would suggest that the strictest attention be paid to at least the following:

1. Impervious and watertight construction of the walls and baffles at the spring.

2. Sloping of the soil, walks and areas immediately adjacent to the spring away from the well so that all surface water may be deflected from it.

3. Fencing carefully and strongly, and so as not to permit trespassing of persons, all the land around the spring or near the stream, confining access and travel of visitors to a circumscribed area which can be thoroughly patrolled and all possible nuisances strictly prevented.

4. The posting of signs against spitting or other acts which may in any way tend to increase the pollution of the ground around the spring, or near the stream.

5. The placing of the glass pump in a separate compartment from the spring, with the glass suction line leading from the spring to this pump well located some little distance from the spring and in such a manner that no pollution from the pump well can find a channel or path back into the spring.

6. The locating of the bottling establishment at as great a distance as practicable, compatible with convenience, from the spring and at a location where topographically and hydrographically any pollution will be deflected or induced away from the spring.

7. If plumbing is installed in the bottling establishment or if comfort stations are located in this vicinity, the utmost care should be taken in the design and construction of the fixtures and pipe so that no leakage or other possible pollution of the spring from this source can occur. All such pipes should be of iron and the sewage should be led to a point outside of the drainage area or cone of depression induced by pumping at the spring.

8. That the most careful system of patrol be established to prevent any commitment of nuisances or any incidental, accidental or wilful pollution from this or other causes to occur anywhere in the vicinity of the spring where it might by surface wash or through underground sources, reach the spring.

9, That immediately around the spring and for as great a distance as practicable, layers of fine, uniform grade sand be deposited to form a very efficient fine grained sand filter for any surface wash that has a tendency to pass down through the soil in the vicinity of the spring.

I wish to emphasize that the development of a bottled water under conditions that will be free from any human pollution is a very difficult matter. It involves not only the precautions above suggested in regard to securing a pure source of supply, but it involves equally the question of scrupulous cleanliness in the operations of bottling the water. This latter refers to cleanliness of employes, cleanliness of wash water, bottles scrubbers, washers, etc., sterilization of bottles, purity of the air surrounding the bottling operations, etc. In fact my experience in the investigation of sources of bottled waters and of bottling works establishments convinces me that not only is it in general difficult to eliminate all human pollution from bottled waters under the most elaborate system of precautionary measures, but that it requires the supervision of a trained bacteriologist familar with the principles of general bacteriology as applied to soil, air and water, in order to develop and maintain a bottled water industry absolutely free from contamination.

It is impossible therefore to anticipate that this project of the Reservation Commission can be consummated with absolute success but I am fully convinced that, if the suggestions and precautions given above are strictly followed out, and assuming that the quality of this spring water at its source is pure, it will be possible to develop this spring and to bottle and place before the public this spring water in a condition which should be substantially pure and free from human contamination.

I have so far seen only chemical analyses of the mineral contents of the water and no sanitary analyses showing the sanitary quality of the water except under conditions which would not seem to be perfectly normal. It would seem that a thorough system of sanitary analyses should be instituted at once and that points for sampling should be so selected as to show the sanitary purity of this spring, not only now but from time to time during the different periods of the year, particularly during the period of development of the spring. Recent analyses of the spring water taken recently from the temporary crib over the spring are no doubt not representative of the spring water in its natural state, i. e. before it has come in contact with the crib work which undoubtedly causes some pollution. It may be that driven wells at this point would be very helpful and instructive, not only in this connection but to determine the mineral content of the water at various depths in the ground water flow at this point.

It is obvious from what has been said that it is not possible to pass any sort of approval upon the proposition as it has been presented to me at this time nor to anticipate what final success the Reservation Commission might have in developing these springs so as to furnish a water that will be free from Colon bacteria. I am inclined to believe that if the ground water in the immediate neighborhood of this spring is free from contamination, with the vigilance and care suggested above, it will be possible to keep the water free from contamination. This however can not be guaranteed, for as pointed out, the conditions under which the Reservation Commission wishes to develop this spring and the esthetic features,— with the public in proximity to the spring, are not compatible with the preservation of the purity of the water, and success of the development along these lines will depend upon the success in removing existing possible sources of contamination and in providing barriers against the possible incidental, accidental and wilful contamination which might take place under the conditions under which the development is proposed. Notwithstanding this however, I believe that the suggestion contained herein may be of some service to the Commission and I recommend that a copy of this report be send to them.

ALBANY, N. Y., *December* 2, 1914

A copy of this report was transmitted to Hon. George Foster Peabody, chairman of the State Reservation Commission.

WARRENSBURG

An investigation of the public water supply of the unincorporated village of Warrensburg, Warren county, was made following an explosive outbreak of gastrointestinal enteritis in the village. This inspection was made on October 29, 1914, by Mr. E. S. Chase, assistant engineer in this Department, accompanied and aided by Dr. C. S. Prest, sanitary supervisor of the district, and Dr. J. E. Goodman, health officer of Warrensburg.

A previous inspection of the water supply of this village was made on January 3, 1912, by Mr. A. O. True, assistant engineer in this Department, and a full report was published in the thirty-third annual report of the department, page 757.

The source of the water supply and the general features of the water works system remain the same as at the time of the previous investigation. At the time certain unsatisfactory conditions were found and recommendations were made in the report for their improvement. The recommendations of the previous report are as follows:

> 1. That the conditions at the various premises along Big Brook which cause or may cause a pollution of the water supply be corrected by the Warrensburg Water Company by —
>
> (a) Removing the sources of pollution to such a distance from the streams or lines of surface drainage as to prevent any direct discharge of organic matter into the water or where such removal is impracticable;
>
> (b) By the construction of watertight vaults or removable watertight receptacles for the retention and storage of all excrementitious and animal organic matters which shall be periodically removed to some suitable place of disposal by burying or other suitable means such as to prevent any pollution of the water supply.
>
> 2. That conditions at the reservoir be improved with reference to the prevention of surface wash and drainage into the reservoir from any ground which may be occupied by animals and also to preventing stock from approaching or entering the reservoir.
>
> 3. That the keeper of the water works be required to make regular and frequent inspections of the whole watershed of each source of supply and of the immediate surroundings of the reservoir in order to discover and abate any conditions causing a direct pollution of the water or any accidental or wilful pollution.
>
> 4. That should further trouble be experienced from tastes and odors due to algae growths in the reservoir the water company endeavor to correct these conditions by the judicious application under the supervision of an expert of minute quantities of copper sulphate to the water in the reservoir.
>
> 5. That if the water company experience any difficulty in preventing any pollution of the public water supply that they apply to this Department for the enactment of rules and regulations for the sanitary protection of the public water supply of the village.

As far as could be determined by the recent investigation none of the above recommendations had been carried out.

As noted in the previous report the supply is derived from three brooks, Harrington brook, Middle or Bennet brook and Big brook. The intakes from each brook are formed by low masonry dams. The intake pipe from Harrington brook is extended to the main leading from the reservoir to the village and the water from this brook does not enter the reservoir but is carried directly to the village. The intakes from the other two brooks are each about a mile or so from the reservoir to which the water is carried by gravity through cast-iron pipes.

Harrington brook has a drainage area of about one-quarter of a square mile and is traversed by a highway upon which are located three houses, only one of which is occupied. This house is located on gently sloping land at some distance from the stream. It is occupied by five persons, none of whom report any recent illness. The other two houses although vacant at present are habitable. This water shed is fairly well covered with trees but the slopes are rather steep.

Middle brook has a drainage area of about one sq. mile and is traversed by the same highway which passes through the Harrington brook drainage area. There are two houses on this water shed only one of which is occupied. In this house there are seven occupants and no contagious or infectious disease has occurred recently. The house is located a short distance from a small tributary to the brook and the privy is at the top of a fairly steep slope about seventy-five feet from this tributary. At this place there seems to be ample opportunity for contamination of Middle brook from animal and human sources. The water shed area is nearly covered with woods.

The drainage area of Big brook is about .9 of a square mile in area and is contiguous to that of Middle brook. This area is crossed by the same highway which crosses the other two areas as well as by another highway which runs approximately parallel to the first and these two highways are connected by a wood road which passes across the area. There are 8 or 9 houses upon this watershed only two of which are at present occupied. The houses which are unoccupied are in one or two cases fairly close to the stream and in case of occupancy there might be danger of contamination from human sources. One of the houses which is occupied is located about one-quarter of a mile above Big brook intake. This house is located on the side hill about 300 feet or so from the stream. The privy is located in a small gully which drains eventually into the stream, although at the foot of the slope there is some low fairly level area. In this house there are 5 or 6 occupants, one of whom is an old soldier and has been a sufferer for some time from apparently a general break down and chronic diarrhea. At this place there is also opportunity for contamination of the brook by drainage from the barn. About one and one-half miles from the intake near the source of the brook is the other occupied house in which but two persons live. At this place, also, the head of the family has been a sufferer from chronic diarrhea for about five years. There is some opportunity for contamination of the stream from animal sources at this place. The greatest danger seems to be from the practice of plowing into the ground the manure from the stable and the material removed from the privy. A portion of the land thus fertilized runs within a few feet of the stream.

Conditions at the main reservoir, which receives water from Big brook and Middle brook were decidedly insanitary. This reservoir is inadequately fenced off and cattle have easy access to it. The hoof prints of cattle were noticed along the shore of the reservoir and manure was noticed in the reservoir itself. About fifty feet from the reservoir on a steep slope toward it is located part of a hog yard. The care-taker's house which is a few hundred feet from the reservoir is located off the drainage area. Previous to the rains occurring about three weeks before the inspection, there had been no water in the reservoir but at the time of the inspection the reservoir was partly full. The small dams forming the reservoir are in poor condition and allow considerable quantities of water to be wasted by leakage and the same is true of the small intake dams.

Trouble has been experienced in the past from shortage of water at times of drought and the physical condition at the diverting dams and main reservoir would indicate that leakage largely accounts for this shortage. With the various structures improved and the main reservoir enlarged it seems probable that, in view of the extent of the watershed area, the supply would be sufficient if properly conserved, although this is a matter which should be studied by the water company or by an engineer employed by them.

Further trouble appears to have been caused by algae growths in the reservoir giving rise to obnoxious tastes and odors. While algae cannot be considered as affecting other than the aesthetic quality of the water, their occurrence in any quantity is decidedly objectionable.

At the time of the recent investigation samples for bacterial analyses were taken from the intakes on each of the three brooks, from the reservoir and from a tap in the village. The results of these analyses together with others made in the past by the Division of Laboratories and Research are given in the appended table.

Analyses of samples taken several days after an outbreak of disease, apparently water-borne, cannot be expected to show other than the general character of the water and cannot indicate the specific quality of the water at the time of the outbreak. The recent analyses do indicate, however, a certain amount of active contamination as shown by the presence of organisms of the B. coli type in samples as small as 1 c.c. While the presence of these organisms does not necessarily mean specific infection it is evidence however, of contamination of animal or human origin. The past analyses have also shown this contamination in varying degrees and this fact, taken in conjunction with the results of the inspection, indicates the potential danger of serious contamination.

Contamination that occurs from sparsely settled areas under ordinary conditions will usually be well disguised by dilution and dispersion. However, under extraordinary conditions, such as heavy rains following a drought, or in a thaw after a period of freezing weather the contamination concentrated at a few points on the watershed may become quickly washed into the supply thereby bringing about a heavy contamination for a comparatively short period. On a watershed such as that of Warrensburg the conditions described above prevail. This supply is subject to a small and constant amount of contamination from animal and human sources but at times, under rain fall conditions similar to those which occurred just previous to the outbreak of enteritis, the supply is undoubtedly subject to intense and serious contamination and possible infection. The small size of the streams and reservoir and the fact that the reservoir contains practically no water after a drought shows that the first flushing of surface run-off after a rain will be carried almost directly into the village mains and to the consumer.

In view of the above facts the following conclusions are drawn:

1. That the water supply of Warrensburg, provided certain precautions outlined below are carried out, should furnish a satisfactory and safe water supply.
2. That under the present conditions the supply is neither satisfactory nor safe either in point of adequacy, esthetic quality nor sanitary quality.
3. That the inadequacy of the supply is largely due to waste from careless methods of collection and storage.
4. That the esthetic quality is affected by algae growths and organic matter of animal origin.
5. That the sanitary quality is menaced by the opportunities for contamination from privies, barnyards, etc., located at certain points on the various watersheds.
6. That specific infection of the supply may have arisen and may in the future arise from the presence of possible bacilli carriers living on the watershed of Big brook comparatively near the stream.

In consideration of the above conclusions I beg to submit the following recommendations:

1. That an adequate supply should be insured by the improvement of the intakes, enlargement of the main reservoir and the prevention of leaks.
2. That the esthetic quality be improved by frequent cleaning of the reservoir, treatment if necessary with copper sulphate for the prevention of algae growths and adequate fencing to prevent access by cattle.
3. That the sanitary quality of the supply be safeguarded by the removal of all places for the deposition of human excreta to such distance from the stream as would prevent drainage from such places into the streams.
4. That the water company make regular and thorough inspections of all watersheds connected with this supply with the end in view of taking action to prevent all possible sources of contamination from animal or human sources.

RESULTS OF WATER ANALYSES

Abbreviations used to describe odors of water: 0, none; 1, very faint; 2, faint; 3, distinct; 4, decided; 5, strong; 6, very strong; a, aromatic; d, disagreeable; e, earthy; f, fishy; g, grassy; m, musty; v, vegetable

Municipality	County	Source of sample	Date of collection	PHYSICAL				CHEMICAL (PARTS PER MILLION)											BACTERIOLOGICAL			
						ODOR		SOLIDS			NITROGEN AS —						HARDNESS			B. COLI TYPE + = PRESENT — = ABSENT		
				Color	Turbidity	Cold	Hot	Total	Loss on ignition	Mineral residue	Free ammonia	Albuminoid ammonia	Nitrites	Nitrates	Oxygen consumed	Chlorine	Total	Alkalinity	Bacteria per c.c. Gelatin 20° 48 Hours	10 c.c.	1 c.c.	1-10 c.c.
Warrensburg	Warren	Tap, public supply	5/ 5/08	18	Cl.	....	....	28	....	....	.008	.046	.001	Tr.	3.80	0.25	12.7	......	800	—	—	—
Warrensburg	Warren	Tap, public supply	4/26/11	25	Tr.	....	....	29	29	9	.004	.056	.001	0.10	3.00	0.87	7.9	6.0	40	3+0—	3+0—	0+3—
Warrensburg	Warren	Tap, public supply	11/ 9/11	45	Cl.	....	....	45	21	24	.008	.142	Tr	0.10	7.20	0.50	14.3	8.0	500	3+0—	3+0—	1+2—
Warrensburg	Warren	Tap, public supply	12/13/11	20	Cl.	....	....	43	26	17	.014	.058	Tr.	0.14	4.00	1.50	15.6	9.0	195	3+0—	1+2—	0+3—
Warrensburg	Warren	Big brook	1/ 3/12	25	Tr.	....	....	43	8	35	.022	.048	Tr.	0.20	3.70	1.37	12.7	7.0	170	3+0—	0+3—	0+3—
Warrensburg	Warren	Harrington brook	1/ 3/12	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	160	1+2—	0+3—	0+3—
Warrensburg	Warren	Middle brook	1/ 3/12	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	120	1+2—	0+3—	0+3—
Warrensburg	Warren	Tap, public supply	1/ 3/12	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	130	2+1—	0+3—	0+3—
Warrensburg	Warren	Tap, public supply	1/30/12	10	Cl.	....	....	50	20	30	.024	.044	.001	0.30	2.40	0.37	18.2	13.0	40	1+2—	0+3—	0+3—
Warrensburg	Warren	Tap, public supply	3/13/12	10	Cl.	....	....	41	10	31	.008	.048	Tr.	0.30	2.50	0.37	19.5	2.0	70	1+2—	0+3—	0+3—
Warrensburg	Warren	Tap, public supply	9/19/12	35	Tr.	....	....	58	25	33	.004	.094	.001	0.06	3.80	0.75	22.1	14.0	1,300	3+0—	3+0—	0+3—
Warrensburg	Warren	Tap, public supply	6/27/13	18	1	1 a.	1 a.	48	....	....	.018	.056	Tr.	0.10	2.80	0.25	18.2	16.0	70	2+1—	0+3—	0+3—
Warrensburg	Warren	Harrington brook	10/25/14	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	*550	3+0—	1+2—	0+3—
Warrensburg	Warren	Bennett (Middle) brook	10/25/14	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	*450	3+0—	1+2—	0+3—
Warrensburg	Warren	Big brook	10/25/14	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	*900	3+0—	1+2—	0+3—
Warrensburg	Warren	Reservoir	10/25/14	25	Cl.	1 v.	1 v.	55	15	40	.002	.063	.001	.004	5.80	0.75	39.0	22.0	*1,000	3+0—	0+3—	0+3—
Warrensburg	Warren	Intake, Harrington brook	10/29/14	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	40	0+3—	0+3—	0+3—
Warrensburg	Warren	Intake, Middle brook	10/29/14	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	40	0+3—	0+3—	0+3—
Warrensburg	Warren	Intake, big brook	10/29/14	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	80	3+0—	1+2—	0—3—
Warrensburg	Warren	Reservoir	10/29/14	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	50	3+0—	2+1—	0+3—
Warrensburg	Warren	Tap, public supply	10/29/14	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	45	2+1—	0+3—	0+3—

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* Two days in transit.

5. That if the water company experience any difficulty in preventing any pollution of the public water supply that they apply to this Department for the enactment of rules and regulations for the sanitary protection of their supply or else install some satisfactory method of purification.

6. That in order to put the water works system in as high state of efficiency as possible and in order that the sanitary quality may be thoroughly safeguarded, it might be well for the water company to retain a competent sanitary engineer to advise them more fully and specifically as to the proper methods to pursue.

ALBANY, N. Y., *November* 12, 1914

Copies of this report were transmitted to the Warrensburg Water Company through Senator James A. Emerson and to the local health officer Dr. J. E. Goodman through Dr. Chas. S. Prest, sanitary supervisor.

WARWICK

Following the receipt of a request from the health officer of Warwick, H. K. Bradner, M. D., for this Department to certify the sanitary quality of the public water supply of Warwick used by the Lehigh & Hudson River R. R. Co. to supply their passenger coaches with drinking water, a reinspection of this water supply was made by Dr. C. W. Berry, sanitary supervisor. This reinspection disclosed the fact that the conditions of the supply were the same as at the time of a previous investigation in 1913. Subsequently a letter was written to Dr. Bradner advising the enactment of rules and regulations for the sanitary protection of the water supply. Later a request for such rules was received from the village authorities and these rules were prepared and enacted.

In addition to the foregoing, inspections were made and reports transmitted to the local authorities or advice was given through correspondence in matters relating to water supplies at the following places:

Corinth
Delhi
Great Valley
Morris
Ogdensburg
Oneonta
Sherburne
West Point (United States Military Academy).

PREPARATION OF RULES FOR THE PROTECTION OF PUBLIC WATER SUPPLIES

One of the important duties of the engineering division is the preparation of rules and regulations for the sanitary protection of public water supplies, the enactment of such rules and regulations being made by this Department under the Public Health Law and at the request of the local officials in charge of the waterworks.

The enforcement of such rules and regulations is a matter which rests largely with the waterworks officials acting in conjunction with this Department and the local boards of health according to definite procedure prescribed by the Public Health Law.

Rules and regulations have now been enacted for 77 water supplies of the some 500 in the State. These rules and regulations are prepared only after careful inspection of the water supply in each case and only after full consideration has been given to the local conditions and requirements:

During the year 1914 there were before the Department for enactment or amendment rules and regulations for the protection of water supplies in the cases of the following municipalities: Arkport, Castleton, Hancock, Hobart, Livingston Manor, Middleburg, Morris, New Berlin, New Paltz, North Tarrytown, Perry (amendment), Roscoe, Saugerties, Sylvan Beach, Tarrytown (amendment), Warwick.

Of the above list rules and regulations were enacted for the villages of Middleburg, New Paltz, Saugerties and Warwick, and amendments for the village of Tarrytown. In the case of Livingston Manor rules were enacted but no notice of their publication as required has been received. In the cases of the other municipalities rules and regulations have been fully prepared but this Department is awaiting further advices from the local authorities before final enactment.

Abstract of the New York State Public Health Law Providing for the Protection from Contamination of the Public Water Supplies throughout the State of New York. Chapter 45 of the Consolidated Laws (Public Health Law) as Amended by Chapter 695 of the Laws of 1911.

"§ 70. Rules and regulations of department. The state department of health may make rules and regulations for the protection from contamination of any or all public supplies of potable waters and their sources within the State, and the commissioner of water supply, gas and electricity of the city of New York may make such rules and regulations subject to the approval of the state department of health for the protection from contamination of any or all public supplies of potable waters and their sources within the state where the same constitute part of the source of the public water supply of said city. If any such rule or regulation relates to a temporary source or act of contamination, any person violating such rule or regulation shall be liable to prosecution for misdemeanor for every such violation, and on conviction shall be punished by a fine not exceeding two hundred dollars, or imprisonment not exceeding one year, or both. If any such rule or regulation relates to a permanent source or act of contamination, said department may impose penalties for the violation thereof or the non-compliance therewith, not exceeding two hundred dollars, for every such violation or non-compliance. Every such rule or regulation shall be published at least once in each week for six consecutive weeks in at least one newspaper of the county where the waters to which it relates are located. The cost of such publication shall be paid by the corporation or municipality benefited by the protection of the water supply to which the rule or regulation published relates. The affidavit of the printer, publisher or proprietor of the newspaper in which the rule or regulation is published may be filed, with the rule or regulation published, in the county clerk's office of such county, and such affidavit and rule and regulation shall be conclusive evidence of such publication, and of all the facts therein stated in all courts and places.

"§ 71. Inspection of water supply. The officer or board having by law the management and control of the potable water supply of any municipality, and in the city of New York, the commissioner of water supply, gas and electricity, or the corporation furnishing such supply, may make such inspection of the sources of such water supply as such officer, board or corporation deems advisable and to ascertain whether the rules and regulations of the state department and of the commissioner of water supply, gas and electricity of the city of New York, are complied with, and shall make such regular or special inspections as the state commissioner of health, or the commissioner of the department of water supply, gas and electricity of the city of New York, may prescribe. If any such inspection discloses a violation of any rule or regulation relating to a temporary or permanent source or act of contamination, such officer, board or corporation shall cause a copy of the rule or regulation violated to be served upon the person violating the same, with a notice of such violation. If the person served does not immediately comply with the rule or regulation violated, such officer, board or corporation, except in a case concerning the violation of a rule or regulation relating to a temporary or permanent source or act of contamination affecting the potable water supply of the city of New York, shall notify the state department of the violation, which shall immediately examine into such violation; and if such person is found by the state department to have actually violated such rule or regulation, the commissioner of health shall order the local board of health of such municipality wherein the violation or non-compliance occurs, to convene and enforce obedience to such rule or regulation. If the local board fails to enforce such order within ten days after its receipt, the corporation furnishing such water supply or the municipality deriving its water supply from the waters to which such rule or regulation relates, or the state commissioner of health or the local board of health of the municipality wherein the water supply protected by these rules is used, or any person interested in the protection of the purity of the water supply, may maintain an action in a court of record which shall be tried in the county where the cause of action arose against such person for the recovery of the penalties incurred by such violation and for an injunction restraining him from the continued violation of such rule or regulation.

If the person served does not comply within five days with the rule or regulation violated, in case such rule or regulation relates to a temporary or permanent source or act of contamination affecting the potable water supply of the city of New York, the commissioner of water supply, gas and electricity of said city may summarily enforce compliance with such rule or regulation, and may summarily abate or remove the cause of the violation of such rule or regulation or the nuisance so created, and to that end may employ such force as may be necessary and proper, provided, however, that no building or improvements shall be removed, disturbed or destroyed by the said commissioner of water supply, gas and electricity until he shall cause measurements to be made of the buildings and photographs of the exterior views thereof, which measurements and photographs shall be at the disposition thereafter of the owners or their attorneys, and failure to exercise such right of abatement shall not be deemed a waiver thereof. Failure to comply within five days with such rule and regulation shall further entitle the city of New York to maintain an action in any court having jurisdiction thereof for the recovery of the penalties incurred by such violation and for an injunction restraining the person or persons violating such rule or regulation, or creating or continuing such nuisance, from the continued violation of such rule or regulation or continuance of such nuisance; the remedy by abatement being not exclusive.

" § 73. Sewerage. When the state department of health, or the commissioner of water supply, gas and electricity of the city of New York, shall, for the protection of a water supply from contamination, make orders or regulations the execution of which will require or make necessary the construction and maintenance of any system of sewerage, or a change thereof, in or for village or hamlet, whether incorporated or unincorporated, or the execution of which will require the providing of some public means of removal or purification of sewage, the municipality or corporation owning the water works benefited thereby shall at its own expense construct and maintain such system of sewerage or change thereof, and provide and maintain such means of removal and purification of sewage and such works or means of sewage disposal as shall be approved by the state department of health, and for that purpose said municipality or corporation may acquire under the general condemnation law, the necessary real estate or interest therein whether now used for public or private purposes. When the execution of any such regulation of the state department of health, or the commission of water supply, gas and electricity of the city of New York, will occasion or require the removal of any building or buildings, the municipality or corporation owning the waterworks benefited thereby shall, at its own expense remove such buildings and pay to the owner thereof all damages occasioned by such removal. When the execution of any such regulation will injuriously affect any property the municipality or corporation owning such water works benefited thereby shall make just and adequate compensation for the property so taken or injured and for all injuries caused to the legitimate use or operation of such property. Until such construction or change of such system or systems of sewerage and the providing of such means of removal or purification of sewage, and until such works or means of sewage disposal and the removal of any building are so made by the municipality or corporation owning the water works to be benefited thereby at its own expense, and until, except in the case of a municipality, the corporation owning the water works benefited shall make just and adequate payment for all injuries to property and for all injuries caused to the legitimate use or operation of such property, there shall be no action or proceeding taken by any such municipality, officer, board, person or corporation against any person or corporation for the violation of any regulation of the state department of health under this article, and no person or corporation shall be considered to have violated or refused to obey any such rule or regulation. The owner of any building the removal of which is occasioned or required, or which has been removed by any rule or regulation of the state department of health or the commissioner of water supply, gas and electricity of the city of New York, made under the provisions of this article, and all persons whose rights of property are injuriously affected by the enforcement of such rule or regulation, shall have a cause of action against the municipality or corporation owning the water works benefited by the enforcement of such rule or regulation, for all damages occasioned or sustained by such removal or enforcement, including all injuries caused to the legitimate use or operation of such property, and an action therefor may be brought against such municipality or corporation in any court of record in the county in which the premises or property affected are situated and shall be tried therein; or such damages may be determined by a special proceeding in the supreme court or the county court of the county in which the property is situated. Such special proceedings shall be commenced by petition and notice to be served by such owner upon the municipality or corporation in the same manner as for the commencement of condemnation proceedings. Such municipality or corporation may make and serve an answer to such petition as in condemnation proceedings. The petition and answer shall set forth the claims of the respective parties, and the provisions of the condemnation law shall be applicable to the subsequent proceedings upon the petition and answer, if any. Either party may, before the services of the petition or answer respectively, offer to take or pay a certain sum, and no costs shall be awarded against either party unless the judgment is more unfavorable to him than his offer. Provided, however, that in case of a summary abatement by a municipality as hereinbefore provided, no costs shall be awarded against the owner of the property damaged, and the commissioners of appraisal in their report shall recommend such additional sum as may in their judgment be reasonable as compensation for witnesses and other necessary expenses of claimant. Such municipality shall, within three calendar months after the confirmation of the report of the commissioners of appraisal, pay to the respective owners and bodies politic or corporate, mentioned or referred to in said report, in whose favor any sum or sums of money shall be estimated and reported by said commissioners, the respective sum or sums of money so estimated and reported in their favor respectively, with lawful interest thereon. And in case of neglect or default in the payment of the same within the time aforesaid, the respective person or persons or bodies politic or corporate in whose favor the same shall be so reported, his, her or their executors, administrators or successors at any time or times after application first made by him, her or them to such municipality for payment thereof, may sue for and recover the same, with lawful interest as aforesaid and the costs of suit in any proper form of action

ainst such municipality in any court having cognizance thereof,
d it shall be sufficient to declare generally for so much money
e to the plaintiff or plaintiffs therein by virtue of this act, and
report of said commissioners, with proof of the right and
le of the plaintiff and plaintiffs to the sum or sums demanded
all be conclusive evidence in such suit or action.

" § 2. Nothing herein contained shall repeal or modify any of
provisions of chapter seven hundred and twenty-four of the
vs of nineteen hundred and five, as amended by chapter three
ndred and fourteen of the laws of nineteen hundred and six."

Concerning the obligation of water corporations or depart-
nts to provide for cost of, or for the making of changes or
provements demanded by the rules, but not specifically men-
ned in section 73 of the above law, the State Attorney-General
s rendered an opinion from which the following is abstracted:

> "In my opinion the proper and only lawful construction which can be placed on section 72* of the Public Health Law is that all damage and injury to the owner of any property affected by changes required to be made to comply with the rules of the department of health must be ascertained and paid prior to the taking possession of the property, and is a prerequisite to the enforcement of said rules in all cases except such as are a nuisance in and of themselves, in which cases the department of health would have power and authority outside of sections 70, 71 and 72* to abate the same. Any other construction would to my mind render the law unconstitutional. In brief, I am of the opinion that the state department of health * * * can make and promulgate rules regulating and controlling the use of premises surrounding the sources in all regards, and that a person violating any of these rules can be punished as provided by the penalties, but before such punishment can be inflicted, the corporation for whose benefit the rules are made and established must pay or tender to the owner of the property affected by the enforcement of such rules an amount equal to all damages for making the changes necessary."

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[*] "This section (72) of the old Public Health Law is now section 73 of chapter 45 of the Con-
dated Laws (Public Health Law)."

MIDDLEBURG

Rules and regulations for the protection from contamination of the public water supply furnished by the Middleburg Water Company of the village of Middleburg in Schoharie county from Huntersland brook.

RULES AND REGULATIONS

The rules and regulations hereinafter given, duly made, and enacted in accordance with the provisions of sections 70, 71, 72 and 73 of chapter 45 of the Consolidated Laws (Public Health Law) as heretofore set forth shall apply to all natural and artificial reservoirs on Huntersland brook and all water courses tributary thereto or ultimately discharging into said reservoirs, these bodies of water being sources of the public water supply furnished by the Middleburg Water Company to the village of Middleburg, Schoharie county, New York. The term "reservoir" wherever used in these rules is intended to mean and refer to all storage and impounding reservoirs on Huntersland brook which are tributary to or which serve as sources of this public water supply or to any additional reservoir which may be constructed or used for the purpose of this public water supply. The term "watercourse" wherever used in these rules is intended to mean and include every spring, pond (other than the artificial reservoirs and filter basins), stream, ditch, gutter, or other channel of every kind, the waters of which when running, whether continuously or occasionally, eventually flow, or may flow, into the water supply furnished by the Middleburg Water Company.

Wherever a linear distance of a structure or object from a reservoir or from a watercourse is mentioned in these rules, it is intended to mean the shortest horizontal distance from the nearest point of the structure or object to the high water mark of a reservoir, or to the edge, margin or precipitous bank forming the ordinary high water mark of such watercourse.

Privies Adjacent to any Reservoir or Watercourse

1. No privy, privy vault, pit, cesspool or any other receptacle of any kind used for either the temporary storage or the permanent deposit of human excreta shall be constructed, placed, maintained, or allowed to remain within fifty (50) feet of any reservoir or any watercourse tributary to the public water supply furnished by the Middleburg Water Company.

2. No privy, privy vault, pit, cesspool or any other receptacles used for the permanent deposit of human excreta, shall be constructed, located, placed, maintained or allowed to remain within two hundred (200) feet of any reservoir or any watercourse tributary to the public water supply furnished by the Middleburg Water Company.

3. Every privy, privy vault, pit or other receptacle or place used for the temporary storage of human excreta which is constructed, located, maintained or allowed to remain between the limiting distances prescribed by rule 1 and the limiting distances prescribed by rule 2 from which privy or other receptacle the excreta are not at once removed by pump or other satisfactory means through watertight pipes or conduits to some proper place of ultimate disposal, as hereinafter provided, shall be arranged in such manner that all such excreta shall be received temporarily in suitable vessels or receptacles which shall at all times be maintained in an absolutely watertight condition and which will permit of convenient removal to some place of ultimate disposal as hereinafter set forth.

4. The excreta collected in the aforesaid temporary receptacles permitted under rule 3 shall be removed and the receptacles thoroughly cleaned and deodorized as often as may be found necessary to maintain the privy in proper sanitary condition and to effectually prevent any overflow upon the soil or upon the foundations or floor of the privy. In effecting this removal the

utmost care shall be exercised that none of the contents be allowed to escape while being transferred from the privy to the place of disposal hereinafter specified, and that the contents, while being transferred from the privy to the place of disposal, shall be thoroughly covered and that the least possible annoyance and inconvenience be caused to occupants of the premises and the adjacent premises.

5. Unless otherwise specially ordered or permitted by the State Department of Health, the excreta collected in the aforesaid temporary receptacles permitted under rule 3 shall, when removed, be disposed of by burying in trenches, or by thoroughly digging it into the soil in such place and manner as to effectually prevent their being washed over the surface of the ground by rain or melting snow, and at distances from any reservoir or watercourse not less than three hundred (300) feet from any reservoir or watercourse tributary to the public water supply furnished by the Middleburg Water Company.

6. Whenever, owing to the character of the soil or of the surface of the ground, or owing to the height or flow of subsoil or surface water, or other special local conditions, it is considered by the State Commissioner of Health that excremental matter from any privy or aforesaid receptacles, or from any trench or place of disposal, or the garbage or wastes from any dump, may be washed over the surface or through the soil in an imperfectly purified condition into any reservoir or watercourse, then the said privy or receptacles for excreta or the trench or place of disposal or the said garbage or waste dump, shall, after due notice to the owner thereof, be removed to such greater distance or to such place as shall be considered safe and proper by the State Commissioner of Health.

Sewage, House Slops, Sink Waste, etc.

7. No house slops, bath water, sewage or other excretal matter from any water closet, privy, cesspool or other source shall be thrown, placed, led, conducted, discharged or allowed to escape or flow in any manner either directly or indirectly into any reservoir or any watercouse tributary to the public water supply furnished by the Middleburg Water Company, nor shall any such matters be thrown, placed, led, discharged or allowed to escape or flow onto the surface of the ground within three hundred (300) feet of said reservoir or watercourse, or into the ground beneath the surface, except into watertight receptacles, the contents of which are to be removed as provided by rule 4, within two hundred (200) feet of any reservoir or any watercourse tributary to the public water supply furnished by the Middleburg Water Company.

8. No garbage, putrescible matter, kitchen or sink wastes, refuse or waste water, from any creamery, cheese factory, laundry nor water in which milk cans, utensils, clothing, bedding, carpets or harnesses have been washed or rinsed, nor any polluted water or liquid of any kind shall be thrown or discharged directly or indirectly into any reservoir or watercourse, nor shall any such liquid or solid refuse or waste be thrown, discharged or allowed to escape or remain upon the surface of the ground or to percolate into or through the ground below the surface in any manner whereby the same may flow into any reservoir or watercourse within a distance of one hundred (100) feet from any reservoir or any watercourse tributary to the public water supply furnished by the Middleburg Water Company.

9. No clothing, bedding, carpets, harness, vehicle, receptacles, utensils, nor anything that pollutes water, shall be washed, rinsed, or placed in any reservoir or watercourse.

Bathing, Animals, Manure, Compost, etc.

10. No person shall be allowed to bathe in any reservoir or watercourse, nor shall any animals or poultry be allowed to stand, wallow, wade or swim in any reservoir or watercourse, nor be washed therein. The watering of animals or poultry in Huntersland brook is prohibited within a distance of

five hundred (500) feet above the intake to the reservoir of the Middleburg Water Company, nor shall any watering place be maintained in such a way as to pollute by muddy leachings or excretal matters any streams tributary to the public water supply furnished by the Middleburg Water Company.

Cattle or live stock shall not be pastured or allowed to graze within twenty-five (25) feet of the banks of Huntersland brook at any point within five hundred (500) feet above the intake to the reservoir of the Middleburg Water Company.

11. No stable for cattle or horses, barnyard, hog yard, pig pen, poultry-house or yard, hitching place or standing place for horses or other animals, manure pile or compost heap, shall be constructed, placed, maintained or allowed to remain with its nearest point less than one hundred (100) feet from any reservoir or any watercourse tributary to the public water supply furnished by the Middleburg Water Company, and none of the above named objects or sources of pollution shall be so constructed, placed, maintained or allowed to remain where or in such a manner that the drainage, leachings or washings from the same may enter any such reservoir or watercourse without first having passed over or through such an extent of soil as to have been properly purified, and in no case shall it be deemed that proper purification has been secured unless the above drainage, leachings or washings shall have percolated over or through the soil in a scattered, dissipated form, and not concentrated in perceptible lines of drainage for a distance of not less than one hundred (100) feet from any reservoir or any watercourse tributary to the public water supply furnished by the Middleburg Water Company.

12. No human excreta, compost or other matter containing same shall be thrown, placed, piled, or allowed to escape into any reservoir or watercourse, nor to be placed, piled, or spread upon the ground, or dug or buried in the soil within a distance of three hundred (300) feet from any reservoir or any watercourse tributary to the public water supply furnished by the Middleburg Water Company, and no manure or compost of any kind shall be placed, piled or spread upon the ground within a distance of seventy-five (75) feet from any reservoir or any watercourse tributary to the public water supply furnished by the Middleburg Water Company.

13. No decayed or fermented fruit or vegetables, cider mill wastes, roots, grain or other vegetable refuse of any kind shall be thrown, placed, discharged or allowed to escape or pass into any reservoir or watercourse, nor shall they be thrown, placed, piled, maintained or allowed to remain in such places that the drainings, leachings or washings therefrom may flow by open, blind or covered drains or channels of any kind into any reservoir or watercourse without first having passed over or through such an extent of soil as to have been properly purified, and in no case shall it be deemed that sufficient purification has been secured unless the above mentioned drainings, leachings, or washings shall have percolated over or through the soil in a scattered, dissipated form, and not concentrated in perceptible lines of drainage, for a distance of not less than seventy-five (75) feet before entering any reservoir or any watercourse tributary to the public water supply furnished by the Middleburg Water Company.

Dead Animals, Offal, Manufacturing Waste, etc.

14. No dead animals, bird, fish, or any part thereof, nor any offal or waste matter of any kind, shall be thrown, placed discharged or allowed to escape or to pass into any reservoir, or watercourse, nor shall any such material or refuse be so located, placed, maintained or allowed to remain that the drainage, leachings, or washings therefrom may reach any such reservoir or watercourse without first having percolated over or through the soil in a scattered, dissipated form and not concentrated in perceptible lines of drainage for a distance of one hundred (100) feet from any reservoir or any watercourse tributary to the public water supply furnished by the Middleburg Water Company.

Fishing, Boating and Ice Cutting

15. No boating, fishing or trespassing of any kind shall be allowed in or upon the waters or ice of any reservoir except by written permission and in strict compliance with the regulations to be adopted by the Middleburg Water Company, nor in any manner that may pollute the waters of this public water supply. All ice cutting shall be done under rigid inspection and supervision of the Middleburg Water Company.

16. No temporary camp, tent, building or other structures for housing laborers engaged on construction work or for other purposes shall be located, placed or maintained within a distance of five hundred (500) feet from any reservoir or watercourse tributary to the public water supply furnished by the Middleburg Water Company.

17. No interment of a human body shall be made within a distance of one hundred (100) feet from any reservoir or any watercourse tributary to the public water supply furnished by the Middleburg Water Company.

18. The Middleburg Water Company shall make regular and thorough inspections of the reservoirs, streams and drainage areas tributary thereto for the purpose of ascertaining whether the above rules and regulations are being complied with, and it shall be the duty of said Middleburg Water Company to cause copies of any rules and regulations violated to be served upon the persons violating the same with notices of such violations; and if such persons served do not immediately comply with the rules and regulations, it shall be the further duty of the Middleburg Water Company to promptly notify the State Commissioner of Health of such violations. The Middleburg Water Company shall report in writing annually on the first of January, the results of the regular inspections made during the preceding year, stating the number of inspections which have been made, the number of violations found, the number of notices served, and the general condition of the watershed at the time of the last inspection.

Penalty

19. In accordance with section 70 of chapter 45 of the Consolidated Laws (Public Health Law), the penalty for each and every violation of or noncompliance with, any of these rules and regulations which relate to a permanent source or act of contamination, is hereby fixed at one hundred ($100) dollars.

The foregoing rules and regulations for the protection from contamination of the public water supply furnished by the Middleburg Water Company to the village of Middleburg, Schoharie county, New York are hereby duly made, ordained and established on this 4th day of February, 1914, pursuant to chapter 45 of the Consolidated Laws (Public Health Law) of the State of New York, as amended by chapter 695 of the Laws of 1911.

HERMANN M. BIGGS,
State Commissioner of Health

ALBANY, N. Y.

These rules and regulations to be operative and valid must first be published at least once each week for six consecutive weeks in at least one newspaper in Schoharie county, and the affidavit of the printer, publisher or proprietor of each newspaper in which such publication is made, that the publication was so made, together with a copy of the rules and regulations, must be filed with the county clerk of that county.

The cost of each publication, affidavit and filing must be paid by the Middleburg Water Company.

NEW PALTZ

Rules and regulations for the protection from contamination of the public water supply of the village of New Paltz, Ulster County.

RULES AND REGULATIONS

The rules and regulations hereinafter given, duly made and enacted in accordance with the provisions of sections 70, 71, 72 and 73 of chapter 45 of the Consolidated Laws (Public Health Law) as heretofore set forth shall apply to all natural and artificial reservoirs and to all watercourses tributary thereto, or ultimately discharging into said reservoirs, these bodies of water being sources of the public water supply of the village of New Paltz, Ulster county, New York.

The term "reservoir" wherever used in these rules is intended to mean and refer to all storage and impounding reservoirs which are tributary to or which serve as sources of this public water supply or to any additional reservoir which may be constructed or used for the purpose of this public water supply. The term "watercourse" wherever used in these rules is intended to mean and include every spring, pond (other than the artificial reservoirs and filter basins), stream, ditch, gutter, or other channel of every kind, the waters of which when running, whether continuously or occasionally, eventually flow into the public supply of the village of New Paltz.

Wherever a linear distance of a structure or object from a reservoir or from a watercourse is mentioned in these rules, it is intended to mean the shortest horizontal distance from the nearest point of the structure or object to the high-water mark of a reservoir, or to the edge, margin or precipitous bank forming the ordinary high-water mark of such watercourse.

Privies Adjacent to any Reservoir or Watercourse

1. No privy, privy vault, pit, cesspool or any other receptacle of any kind used for either the temporary storage or the permanent deposit of human excreta shall be constructed, placed, maintained, or allowed to remain within one hundred (100) feet of any reservoir or water course tributary to the public water supply of the village of New Paltz.

2. No privy, privy vault, pit, cesspool or any other receptacle used for the permanent deposit of human excreta, shall be constructed, located, placed, maintained or allowed to remain within three hundred (300) feet of any reservoir or watercourse tributary to the public water supply of the village of New Paltz.

3. Every privy, privy vault, pit or other receptacle or place used for the temporary storage of human excreta which is constructed, located, maintained or allowed to remain between the limiting distances prescribed by Rule 1 and the limiting distances prescribed by Rule 2 from which privy or other receptacle the excreta are not at once removed by pump or other satisfactory means through watertight pipes or conduits to some proper place of ultimate disposal, as hereinafter provided, shall be arranged in such manner that all such excreta shall be received temporarily in suitable vessels or receptacles which shall at all times be maintained in an absolutely watertight condition and which will permit of convenient removal to some place of ultimate disposal as hereinafter set forth.

4. The excreta collected in the aforesaid temporary receptacles permitted under Rule 3 shall be removed and the receptacles thoroughly cleaned and deodorized as often as may be found necessary to maintain the privy in proper sanitary condition and to effectually prevent any overflow upon the soil or upon the foundation or floor of the privy. In effecting this removal the utmost care shall be exercised that none of the contents be allowed to escape while being transferred from the privy to the place of disposal hereinafter specified, and that the contents, while being transferred from the

privy to the place of disposal, shall be thoroughly covered and that the least possible annoyance and inconvenience be caused to occupants of the premises and the adjacent premises.

5. Unless otherwise specially ordered or permitted by the State Department of Health, the excreta collected in the aforesaid temporary receptacles permitted under Rule 3 shall, when removed, be disposed of by burying in trenches or pits at a depth of not less than 18 inches below the surface and at a distance not less than three hundred (300) feet from any reservoir or watercourse tributary to the public water supply of the village of New Paltz.

6. Whenever, owing to the character of the soil or of the surface of the ground, or owing to the height or flow of subsoil or surface water, or other special local conditions, it is considered by the State Commissioner of Health that excremental matter from any privy or aforesaid receptacles, or from any trench or place of disposal, or the garbage or wastes from any dump, may be washed over the surface or through the soil in an imperfectly purified condition into any reservoir or watercourse, then the said privy or receptacles for excreta or the trench or place of disposal of the aforesaid garbage or waste dump, shall, after due notice to the owner thereof, be removed to such greater distance or to such place as shall be considered safe and proper by the State Commissioner of Health.

Sewage, House Slops, Sink Waste, etc.

7. No house slops, bath water, sewage or other excretal matter from any water closet, privy, cesspool or other source shall be thrown, placed, led, conducted, discharged or allowed to escape or flow in any manner, either directly or indirectly into any reservoir or any watercourse tributary to the public water supply of the village of New Paltz, nor shall any such matters be thrown, placed, led, discharged, or allowed to escape or flow onto the surface of the ground or into the ground beneath the surface, except into watertight receptacles, the contents of which are to be removed as provided by Rule 4, within three hundred (300) feet of any reservoir or watercourse tributary to the public water supply of the village of New Paltz.

8. No garbage, putrescrible matter, kitchen or sink wastes, refuse or waste water, from any creamery, cheese factory, laundry nor water in which milk cans, utensils, clothing, bedding, carpets or harnesses have been washed or rinsed, nor any polluted water or liquid of any kind shall be thrown or discharged directly or indirectly into any reservoir or watercourse, nor shall any such liquid or solid refuse or waste be thrown, discharged or allowed to escape or remain upon the surface of the ground or to percolate into or through the ground below the surface in any manner whereby the same may flow into any reservoir or watercourse within a distance of two hundred (200) feet from any reservoir or watercourse tributary to the public water supply of the village of New Paltz.

9. No clothing, bedding, carpets, harness, vehicle, receptacles, utensils, nor anything that pollutes water, shall be washed, rinsed, or placed in any reservoir or watercourse.

Bathing, Animals, Manure, Compost, etc.

10. No person shall be allowed to bathe in any reservoir or watercourse, nor shall any animals or poultry be allowed to stand, wallow, wade or swim in any reservoir or watercourse, nor be washed therein. The watering of animals or poultry in any reservoir of the public water supply of the village of New Paltz, is prohibited, nor shall any such watering be allowed in any watercourse tributary to this water supply within one thousand (1,000) feet of said reservoirs. No watering place shall be maintained in such a way as to pollute with muddy leachings or excretal matters any streams tributary to the public water supply of the village of New Paltz.

11. No stable for cattle or horses, barnyard, hog yard, pig pen, poultry house or yard, hitching place or standing place for horses or other animals, manure pile or compost heap, shall be constructed, placed, maintained or allowed to remain with its nearest point less than one hundred and fifty (150)

feet from any reservoir or watercourse tributary to the public water supply of the village of New Paltz.

None of the above-named objects or sources of pollution shall be so constructed, placed, maintained or allowed to remain where or in such a manner that the drainage, leachings or washings from the same may enter any such reservoir or watercourse without first having passed over or through such an extent of soil as to have been properly purified, and in no case shall it be deemed that proper purification has been secured unless the above drainings, leachings or washings shall have percolated over or through the soil in a scattered, dissipated form, and not concentrated in perceptible lines of drainage for a distance of not less than one hundred and fifty (150) feet from any reservoir or watercourse tributary to the public water supply of the village of New Paltz.

12. No human excreta, compost or other matter containing same shall be thrown, placed or allowed to escape into any reservoir or watercourse, nor to be placed, piled or spread upon the surface of the ground at any point on any watershed tributary to the public water supply of the village of New Paltz; nor shall such human excreta, compost or other matter containing the same be dug or buried in the soil at a less depth than 18 inches below the surface nor within a distance of three hundred (300) feet from any reservoir or watercourse tributary to the public water supply of the village of New Paltz, and no manure or compost of any kind shall be placed, piled or spread upon the ground within a distance of one hundred (100) feet from any reservoir or watercourse tributary to the public water supply of the village of New Paltz.

13. No decayed or fermented fruit or vegetables, cider mill wastes, roots, grain or other vegetable refuse of any kind shall be thrown, placed, discharged or allowed to escape or pass into any reservoir or watercourse, nor shall they be thrown, placed, piled, maintained or allowed to remain in such places that the drainage, leachings or washings therefrom may flow by open, blind or covered drains or channels of any kind into any reservoir or watercourse without first having passed over or through such an extent of soil as to have been properly purified, and in no case shall it be deemed that sufficient purification has been secured unless the above mentioned drainings, leachings or washings shall have percolated over or through the soil in a scattered, dissipated form, and not concentrated in perceptible lines of drainage, for a distance of not less than one hundred (100) feet before entering any reservoir or watercourse tributary to the public water supply of the village of New Paltz.

Dead Animals, Offal, Manufacturing Waste, etc.

14. No dead animals, bird, fish, or any part thereof, nor any offal or waste matter of any kind, shall be thrown, placed, discharged or allowed to escape or to pass into any reservoir, or watercourse. Nor shall any such material or refuse be so located, placed, maintained or allowed to remain that the drainage, leachings, or washings therefrom may reach any such reservoir or watercourse without having first percolated over or through the soil in a scattered, dissipated form and not concentrated in perceptible lines of drainage, for a distance of two hundred (200) feet from any reservoir or watercourse tributary to the public water supply of the village of New Paltz.

Fishing, Boating and Ice Cutting

15. No boating of any kind, or fishing from boats, or through the ice, or any trespassing whatever shall be allowed in or upon the waters or ice of the reservoirs except by written permission and in strict compliance with the regulations to be adopted by the board of trustees of the village of New Paltz. All ice cutting shall be done under rigid inspection and supervisions of the board of trustees of the village of New Paltz.

16. No temporary camp, tent, building or other structure for housing laborers engaged on construction work or for other purposes shall be located, placed or maintained within a distance of five hundred (500) feet from any reservoir or watercourse tributary to the public water supply of the village of New Paltz.

Cemeteries

17. No interment of a human body shall be made within a distance of two hundred and fifty (250) feet from any reservoir or from any watercourse tributary to the public water supply of the village of New Paltz.

18. The board of trustees shall make regular and thorough inspections of the reservoirs, streams and drainage areas tributary thereto for the purpose of ascertaining whether the above rules and regulations are being complied with, and it shall be the duty of said board of trustees to cause copies of any rules.and regulations violated to be served upon the persons violating the same with notices of such violations; and if such persons served do not immediately comply with the rules and regulations, it shall be the further duty of the board of trustees to promptly notify the State Commissioner of Health of such violations. The board of trustees shall report in writing annually on the first of January, the results of the regular inspections made during the preceding year, stating the number of inspections which have been made, the number of violations found, the number of notices served, and the general condition of the watershed at the time of the last inspection.

Penalty

19. In accordance with section 70 of chapter 45 of the Consolidated Laws (Public Health Law), the penalty for each and every violation of or noncompliance with, any of these rules and regulations which relate to a permanent source or act of contamination, is hereby fixed at one hundred (100) dollars.

The foregoing rules and regulations for the protection from contamination of the public water supply of the village of New Paltz are hereby duly made, ordained and established on this 7th day of December, 1914, pursuant to chapter 45 of the Consolidated Laws (Public Health Law) of the State of New York, as amended by chapter 695 of the Laws of 1911.

LINSLY R. WILLIAMS,
Deputy State Commissioner of Health

ALBANY, N. Y.

These rules and regulations to be operative and valid must first be published at least once each week for six consecutive weeks in at least one newspaper in Ulster county, and the affidavit of the printer, publisher or proprietor of each newspaper in which such publication is made, that the publication was so made, together with a copy of the rules and regulations, must be filed with the county clerk of that county.

The cost of each such publication, affidavit and filing must be paid by the village of New Paltz.

SAUGERTIES

Rules and regulations for the protection from contamination of the public water supply of the village of Saugerties, Ulster county.

RULES AND REGULATIONS

The rules and regulations hereinafter given, duly made and enacted in accordance with the provisions of sections 70, 71, 72 and 73 of chapter 45 of the Consolidated Laws (Public Health Law) as heretofore set forth shall apply to all natural and artificial reservoirs on the Plattekill creek, and all watercourses tributary thereto or ultimately discharging into said reservoirs, those bodies of water being sources of the public water supply of the village of Saugerties, Ulster county, New York.

The term "reservoir" wherever used in these rules is intended to mean and refer to all storage and impounding reservoirs on Plattekill creek which are tributary to or which serve as sources of this public water supply or to any additional reservoir which may be constructed or used for the purpose of this public water supply. The term "watercourse" wherever used in these rules is intended to mean and include every spring, pond (other than the artificial reservoirs and filter basins, stream, ditch, gutter, or other channel of every kind, the waters of which when running, whether continuously or occasionally, eventually flow, or may flow, into the water supply of the village of Saugerties.

Wherever a linear distance of a strucfure or object from a reservoir or from a watercourse is mentioned in these rules, it is intended to mean the shortest horizontal distance from the nearest point of the structure or object to the high-water mark of a reservoir, or to the edge, margin or precipitous bank forming the ordinary high-water mark of such watercourse.

Privies Adjacent to any Reservoir or Watercourse

1. No privy, privy vault, pit, cesspool or any other receptacle of any kind used for either the temporary storage or the permanent deposit of human excreta shall be constructed, placed, maintained, or allowed to remain within seventy-five (75) feet of any reservoir or watercourse tributary to the public water supply of the village of Saugerties.

2. No privy, privy vault, pit, cesspool or any other receptacle used for the permanent deposit of human excreta, shall be constructed, located, placed, maintained or allowed to remain within two hundred (200) feet of any reservoir or any watercourse tributary to the public water supply of the village of Saugerties.

3. Every privy, privy vault, pit or other receptacle or place used for the temporary storage of human excreta which is constructed, located, maintained or allowed to remain between the limiting distances prescribed by Rule 1 and the limiting distances prescribed by Rule 2 from which privy or other receptacle the excreta are not at once removed by pump or other satisfactory means through watertight pipes or conduits to some proper place of ultimate disposal, as hereinafter provided, shall be arranged in such manner that all such excreta shall be received temporarily in suitable vessels or receptacles which shall be at all times maintained in an absolutely watertight condition and which will permit of convenient removal to some place of ultimate disposal as hereinafter set forth.

4. The excreta collected in the aforesaid temporary receptacles permitted under Rule 3 shall be removed and the receptacles thoroughly cleaned and deodorized as often as may be found necessary to maintain the privy in proper sanitary condition and to effectually prevent any overflow upon the soil or upon the foundations or floor of the privy. In effecting this removal the utmost care shall be exercised that none of the contents be allowed to escape while being transferred from the privy to the place of disposal hereinafter specified, and that the contents, while being transferred from the privy to the place of disposal, shall be thoroughly covered and that the least possible annoyance and inconvenience be caused to occupants of the premises and the adjacent premises.

5. Unless otherwise specially ordered or permitted by the State Department of Health, the excreta collected in the aforesaid temporary receptacles permitted under Rule 3 shall, when removed, be disposed of by burying in trenches or pits at a depth of not less than 18 inches below the surface and at a distance not less than three hundred (300) feet from any reservoir or watercourse tributary to the public water supply of the village of Saugerties.

6. Whenever, owing to the character of the soil or of the surface of the ground, or owing to the height or flow of subsoil or surface water, or other special local conditions, it is considered by the State Commissioner of Health that excremental matter from any privy or aforesaid receptacles, or from any trench or place of disposal, or the garbage or wastes from any dump, may be washed over the surface or throuh the soil in an imperfectly purified condition into any reservoir or watercourse, then the said privy or receptacles for

excreta or the trench or place of disposal or the said garbage or waste dump, shall, after due notice to the owner thereof, be removed to such greater distance or to such place as shall be considered safe and proper by the State Commissioner of Health.

Sewage, House Slops, Sink Wastes, etc.

7. No house slops, bath water, sewage or other excretal matter from any water closet, privy, cesspool or other source shall be thrown, placed, led, conducted, discharged or allowed to escape or flow in any manner either directly or indirectly into any reservoir or any watercourse tributary to the public water supply of the village of Saugerties, nor shall any such matters be thrown, placed, led, discharged or allowed to escape or flow onto the surface of the ground or into the ground beneath the surface, except into watertight receptacles, the contents of which are to be removed as provided by Rule 4 within three hundred (300) feet of any reservoir or any watercourse tributary to the public water supply of the village of Saugerties.

8. No garbage, putrescible matter, kitchen or sink wastes, refuse or waste water, from any creamery, cheese factory, laundry, nor water in which milk cans, utensils, clothing, bedding, carpets or harnesses have been washed or rinsed, nor any polluted water or liquid of any kind shall be thrown or discharged directly or indirectly into any reservoir or watercourse, nor shall any such liquid or solid refuse or waste be thrown, discharged or allowed to escape or remain upon the surface of the ground or to percolate into or through the ground below the surface in any manner whereby the same may flow into any reservoir or watercourse within a distance of one hundred (100) feet from any reservoir or any watercourse tributary to the public water supply of the village of Saugerties.

9. No clothing, bedding, carpets, harness, vehicle, receptacle, utensils, nor anything that pollutes water, shall be washed, rinsed, or placed in any reservoir or watercourse.

Bathing, Animals, Manure, Compost, etc.

10. No person shall be allowed to bathe in any reservoir or watercourse, nor shall any animal or poultry be allowed to stand, wallow, wade or swim in any reservoir or watercourse, nor be washed therein. The watering of animals or poultry in any reservoir of the public water supply of the village of Saugerties is prohibited, nor shall any such watering be allowed in any watercourse tributary to this supply within one thousand (1,000) feet of said reservoirs. No watering place shall be maintained in such a way as to pollute by muddy leachings or excretal matters any streams tributary to the public water supply of the village of Saugerties.

11. No stable for cattle or horses, barnyard, hog yard, pig pen, poultry house or yard, hitching place or standing place for horses or other animals, manure pile or compost heap, shall be constructed, placed, maintained or allowed to remain with its nearest point less than one hundred (100) feet from any reservoir or any watercourse tributary to the public water supply of the village of Saugerties, and none of the above named objects or sources of pollution shall be so constructed, placed, maintained or allowed to remain where or in such a manner that the drainings, leachings or washings from the same may enter any such reservoir or watercourse without first having passed over or through such an extent of soil as to have been properly purified, and in no case shall it be deemed that proper purification has been secured unless the above drainings, leachings or washings shall have percolated over or through the soil in a scattered, dissipated form, and not concentrated in perceptible lines of drainage for a distance of not less than one hundred (100) feet from any reservoir or any watercourse tributary to the public water supply of the village of Saugerties.

12. No human excreta, compost or other matter containing same shall be thrown, placed, or allowed to escape into any reservoir or watercourse, nor to be placed, piled or spread upon the ground at any point on any watershed tributary to the public water supply of the village of Saugerties, nor

shall such human excreta, compost or other matter containing the same be dug or buried in the soil at a less depth than 18 inches below the surface nor within a distance of three hundred (300) feet from any reservoir or any watercourse tributary to the public water supply of the village of Saugerties, and no manure or compost of any kind shall be placed, piled or spread upon the ground within a distance of one hundred (100) feet from any reservoir or any watercourse tributary to the public water supply of the village of Saugerties.

13. No decayed or fermented fruit or vegetables, cider mill wastes, roots, grain or other vegetable refuse of any kind shall be thrown, placed, discharged or allowed to escape or pass into any reservoir, or watercourse, nor shall they be thrown, placed, piled, maintained or allowed to remain in such places that the drainings, leachings or washings therefrom may flow by open, blind or covered drains or channels of any kind into any reservoir or watercourse without first having passed over or through such an extent of soil as to have been properly purified, and in no case shall it be deemed that sufficient purification has been secured unless the above mentioned drainings, leachings or washings shall have percolated over or through the soil in a scattered, dissipated form, and not concentrated in perceptible lines of drainage, for a distance of not less than one hundred (100) feet before entering any reservoir or any watercourse tributary to the public water supply of the village of Saugerties.

Dead Animals, Offal, Manufacturing Wastes, etc.

14. No dead animals, bird, fish, or any part thereof, nor any offal or waste matter of any kind; shall be thrown, placed, discharged or allowed to escape or to pass into any reservoir, or watercourse, nor shall any such material or refuse be so located, placed, maintained or allowed to remain that the drainings, leachings, or washings therefrom may reach any such reservoir or watercourse without having first percolated over or through the soil in a scattered, dissipated form and not concentrated in perceptible lines of drainage, for a distance of one hundred and fifty (150) feet from any reservoir or any watercourse tributary to the public water supply of the village of Saugerties.

Fishing, Boating and Ice Cutting

15. No boating of any kind, or fishing from boats, or through the ice, or any trespassing whatever shall be allowed in or upon the waters or ice of the reservoirs except by written permission and in strict compliance with the regulations to be adopted by the Board of Water Commissioners of the village of Saugerties; nor in any manner that may pollute the waters of this public water supply. All ice cutting shall be done under rigid inspection and supervision of the Board of Water Commissioners.

16. No temporary camp, tent, building or other structure for housing laborers engaged on construction work or for other purposes shall be located, placed or maintained within a distance of five hundred (500) feet from any reservoir or watercourse tributary to the public water supply of the village of Saugerties.

Cemeteries

17. No interment of a human body shall be made within a distance of two hundred and fifty (250) feet from any reservoir or from any watercourse tributary to the public water supply of the village of Saugerties.

18. The Board of Water Commissioners shall make regular and thorough inspections of the reservoirs, streams and drainage areas tributary thereto for the purpose of ascertaining whether the above rules and regulations are being complied with, and it shall be the duty of said Board of Water Commissioners to cause copies of any rules and regulations violated to be served upon the persons violating the same with notices of such violations; and if such persons served do not immediately comply with the rules and regulations, it shall be the further duty of the Board of Water Commissioners to promptly notify the State Commissioner of Health of such violations.

he Board of Water Commissioners shall report in writing annually on the rst of January, the results of the regular inspections made during the receding year, stating the number of inspections which have been made, e number of violations found, the number of notices served, and the general ndition of the watershed at the time of the last inspection.

Penalty

19. In accordance with Section 70 of Chapter 45 of the Consolidated Laws Public Health Law), the penalty for each and every violation of or non- mpliance with, any of these rules and regulations which relate to a perma- nt source or act of contamination, is hereby fixed at one hundred (100) llars.

The foregoing rules and regulations for the protection from contamina- on of the public water supply of the village of Saugerties are hereby duly ade, ordained and established on this 17th day of July, 1914, pursuant Chapter 45 of the Consolidated Laws (Public Health Law) of the State New York, as amended by Chapter 695 of the Laws of 1911.

LINSLY R. WILLIAMS,
Deputy State Commissioner of Health

LBANY, N. Y.

These rules and regulations to be operative and valid must first be pub- shed at least once each week for six consecutive weeks in at least one ewspaper in Ulster county, and the affidavit of the printer, publisher or roprietor of each newspaper in which such publication is made, that the ublication was so made, together with a copy of the rules and regulations, ust be filed with the County Clerk of that county.

The cost of each such publication, affidavit and filing must be paid by the illage of Saugerties.

TARRYTOWN

Rules and regulations for the protection from contamination f the public water supply of the village of Tarrytown, West- hester county.

RULES AND REGULATIONS

The rules and regulations hereinafter given, duly made and enacted in ccordance with the provisions of sections 70, 71, 72 and 73 of chapter 45 of e Consolidated Laws (Public Health Law), shall apply to all natural and rtificial reservoirs and all watercourses tributary thereto or ultimately ischarging into said reservoirs, these bodies of water being sources of the ublic water supply of the village of Tarrytown, Westchester county, N. Y. he term "reservoir" wherever used in these rules is intended to mean and efer to all storage and impounding reservoirs which are tributary to or hich serve as sources of this public water supply or to any additional eservoir which may be constructed or used for the purpose of this public ater supply. The term "watercourse" wherever used in these rules is tended to mean and include every spring, pond (other than the artificial eservoirs and filter basins), stream, ditch, gutter, or other channel of every ind the waters of which when running, whether continuously or occasionally, ventually flow or may flow into the public water supply of the village of arrytown.

Wherever a linear distance of a structure or object from a reservoir or from watercourse is mentioned in these rules, it is intended to mean the shortest orizontal distance from the nearest point of the structure or object to the igh water mark of a reservoir, or to the edge, margin or precipitous bank rming the ordinary high water mark of such watercourse.

Privies Adjacent to Any Reservoir or Watercourse

1. No privy, privy vault, pit, cesspool or any other receptacle of any kind used for either the temporary storage or the permanent deposit of human excreta shall be constructed, placed, maintained, or allowed to remain within fifty (50) feet of any reservoir or watercourse tributary to the public water supply of the village of Tarrytown.

2. No privy, privy vault, pit, cesspool or any other receptacle used for the permanent deposit of human excreta, shall be constructed, located, placed, maintained or allowed to remain within three hundred (300) feet of any reservoir or to remain within one hundred and fifty (150) feet of any watercourse tributary to that reservoir known as the "lower lake", nor within seventy-five (75) feet of any watercourse tributary to that reservoir known as the "upper lake", said bodies of water being tributary to the public water supply of the village of Tarrytown.

3. No cesspool, pit or other receptacle of any kind used for the temporary storage of human excreta or sewage shall be constructed, located, maintained or allowed to remain between the limiting distances prescribed by rule 1 and the limiting distances prescribed by rule 2, unless said cesspool, pit or other receptacle is so arranged and equipped that the said excreta or sewage are at once removed by pump or other satisfactory means through watertight pipes or conduits to some proper place of ultimate disposal, as hereinafter provided; or unless suitable vessels or receptacles for the temporary storage of said human excreta or sewage are provided and at all times maintained in an absolutely watertight condition in such a manner as to permit of convenient removal of said excreta or sewage to some place of ultimate disposal as hereinafter set forth.

4. The excreta collected in the aforesaid temporary receptacles permitted under rule 3 shall be removed and the receptacles thoroughly cleaned and deodorized as often as may be found necessary to maintain the privy in proper sanitary condition and to effectually prevent any overflow upon the soil or upon the foundations or floor of the privy. In effecting this removal the utmost care shall be exercised that none of the contents be allowed to escape while being transferred from the privy to the place of disposal hereinafter specified, and that the contents, while being transferred from the privy to the place of disposal, shall be thoroughly covered and that the least possible annoyance and inconvenience be caused to occupants of the premises and the adjacent premises.

5. Unless otherwise specially ordered or permitted by the State Department of Health, the excreta collected in the aforesaid temporary rceptacles permitted under rule 3 shall, when removed, be disposed of by burying in trenches or pits at a depth of not less than 18 inches below the surface and at a distance not less than three hundred (300) feet from any reservoir or watercourse tributary to the public water supply of the village of Tarrytown.

6. Whenever, owing to the character of the soil or of the surface of the ground, or owing to the height or flow of subsoil or surface water, or other special local conditions, it is considered by the State Commissioner of Health that excremental matter from any privy or aforesaid receptacles, or from any trench or place of disposal or the garbage or wastes from any dump, may be washed over the surface or through the soil in an imperfectly purified condition into any reservoir or watercourse, then the said privy or receptacles for excreta or the trench or place of disposal or the said garbage or waste dump, shall, after due notice to the owner thereof, be removed to such greater distance or to such place as shall be considered safe and proper by the State Commissioner of Health.

Sewage, House Slops, Sink Wastes, etc.

7. No house slops, bath water, sewage or other excretal matter from any water closet, privy, cesspool or other source shall be thrown, placed, led, conducted, discharged or allowed to escape or flow in any manner either directly or indirectly into any reservoir or any watercourse tributary to the public water supply of the village of Tarrytown, nor shall any such matters be

thrown, placed, led, discharged or allowed to escape or flow onto the surface of the ground or into the ground beneath the surface, except into watertight receptacles, the contents of which are to be removed as provided by Rule 4 within three hundred (300) feet of any reservoir, nor within one hundred and fifty (150) feet of any watercourse tributary to that reservoir known as the "lower lake" nor within seventy-five (75) feet of any watercourse tributary to that reservoir known as the "upper lake," said bodies of water being tributary to the public water supply of the village of Tarrytown.

8. No garbage, putrescible matter, kitchen or sink wastes, refuse or waste water, from any creamery, cheese factory, laundry nor water in which milk cans, utensils, clothing, bedding, carpets or harnesses have been washed or rinsed, nor any polluted water or liquid of any kind shall be thrown or discharged directly or indirectly into any reservoir or watercourse, nor shall any such liquid or solid refuse or waste be thrown, discharged or allowed to escape or remain upon the surface of the ground or to percolate into or through the ground below the surface in any manner whereby the same may flow into any reservoir or watercourse within a distance of one hundred (100) feet from any reservoir or seventy-five (75) feet from any watercourse tributary to the public water supply of the village of Tarrytown.

9. No clothing, bedding, carpets, harness, vehicle, receptacles, utensils, nor anything that pollutes water, shall be washed, rinsed, or placed in any reservoir or watercourse.

Bathing, Animals, Manure, Compost, etc.

10. No person shall be allowed to bathe in any reservoir or watercourse, nor shall any animals or poultry be allowed to stand, wallow, wade, or swim in any reservoir or watercourse, nor be washed therein. The watering of animals or poultry in any reservoir of the public water supply of the village of Tarrytown is prohibited; nor shall any such watering be allowed in any watercourse tributary to this water supply within one thousand (1,000) feet of said reservoirs. No watering place shall be maintained in such a way as to pollute with muddy leachings or excretal matters any streams tributary to the public water supply of the village of Tarrytown.

11. No stable for cattle or horses, barnyard, hog yard, pig pen, poultry house or yard, hitching place or standing place for horses or other animals, manure pile or compost heap, shall be constructed, placed, maintained or allowed to remain with its nearest point less than one hundred and fifty (150) feet from any reservoir, or seventy-five (75) feet from any watercourse tributary to the public water supply of the village of Tarrytown, and none of the above named objects or sources of pollution shall be so constructed, placed, maintained or allowed to remain where or in such a manner that the drainings, leachings or washings from the same may enter any such reservoir or watercourse without first having passed over or through such an extent of soil as to have been properly purified, and in no case shall it be deemed that proper purification has been secured unless the above drainings, leachings or washings shall have percolated over or through the soil in a scattered, dissipated form, and not concentrated in perceptible lines of drainage for a distance of not less than one hundred and fifty (150) feet from any reservoir or seventy-five (75) feet from any watercourse tributary to the public water supply of the village of Tarrytown.

12. No human excreta, compost or other matter containing same shall be thrown, placed or allowed to escape into any reservoir or watercourse, nor to be placed, piled or spread upon the surface of the ground at any point on the watershed tributary to the public water supply of the village of Tarrytown; nor shall such human excreta, compost or other matter containing the same be dug or buried in the soil at a less depth than 18 inches below the surface nor within a distance of three hundred (300) feet from any reservoir or watercourse tributary to the public water supply of the village of Tarrytown, and no manure or compost of any kind shall be placed, piled or spread upon the ground within a distance of one hundred (100) feet from any reservoir or watercourse tributary to the public water supply of the village of Tarrytown.

13. No decayed or fermented fruit or vegetables, cider mill wastes, roots, grain or other vegetable refuse of any kind shall be thrown, placed, discharged or allowed to escape or pass into any reservoir or watercourse, nor shall they be thrown, placed, piled, maintained or allowed to remain in such places that the drainage, leachings or washings therefrom may flow by open, blind or covered drains or channels of any kind into any reservoir or watercourse without first having passed over or through such an extent of soil as to have been properly purified, and in no case shall it be deemed that sufficient purification has been secured unless the above mentioned drainings, leachings or washings shall have percolated over or through the soil in a scattered, dissipated form, and not concentrated in perceptible lines of drainage, for a distance of not less than one hundred (100) feet before entering any reservoir or fifty (50) feet before entering any watercourse tributary to the public water supply of the village of Tarrytown.

Dead Animals, Offal, Manufacturing Waste, etc.

14. No dead animals, bird, fish, or any part thereof nor any offal or waste matter of any kind, shall be thrown, placed, discharged or allowed to escape or to pass into any reservoir or watercourse. Nor shall any such material or refuse be so located, placed, maintained or allowed to remain that the drainage, leachings or washings therefrom mav reach any such reservoir or watercourse without having first percolated over or through the soil in a scattered, dissipated form and not concentrated in perceptible lines of drainage for a distance of one hundred and fifty (150) feet from any reservoir, or one hundred (100) feet from any watercourse tributary to the public water supply of the village of Tarrytown.

Fishing, Boating and Ice Cutting

15. No boating of any kind, or fishing from boats, or through the ice, or any trespassing whatever shall be allowed in or upon the waters or ice of the reservoirs. All ice cutting shall be done under rigid inspection and supervision of the board of water commissioners of the village of Tarrytown.

16. No temporary camp, tent, building or other structures for housing laborers engaged on construction work or for other purposes shall be located, placed or maintained within a distance of five hundred (500) feet from any reservoir or watercourse tributary to the public water supply of the village of Tarrytown.

Cemeteries

17. No interment of a human body shall be made within a distance of three hundred (300) feet from any reservoir or from any watercourse tributary to the public water supply of the village of Tarrytown.

18. The board of water commissioners of the village of Tarrytown shall make regular and thorough inspections of the reservoirs, streams and drainage areas tributary thereto for the purpose of ascertaining whether the above rules and regulations are being complied with, and it shall be the duty of said board of water commissioners to cause copies of any rules and regulations violated to be served upon the persons violating the same with notices of such violations; and if such persons served do not immediately comply with the rules and regulations it shall be the further duty of the board of water commissioners to promptly notify the State Commissioner of Health of such violations. The board of water commissioners shall report in writing annually on the first of January the results of the regular inspections made during the preceding year, stating the number of inspections which have been made, the number of violations found, the number of notices served, and the general condition of the watershed at the time of the last inspection.

Penalty

19. In accordance with section 70 of chapter 45 of the Consolidated Laws (Public Health Law), the penalty for each and every violation of, or noncompliance with, any of these rules and regulations which relate to a permanent source or act of contamination, is hereby fixed at two hundred (200) dollars.

The foregoing rules and regulations for the protection from contamination of the public water supply of the village of Tarrytown are hereby duly made, ordained, and established on this seventh day of December, 1914, pursuant to chapter 45 of the Consolidated Laws (Public Health Law) of the State of New York, as amended by chapter 695 of the Laws of 1911.

LINSLY R. WILLIAMS,
Deputy State Commissioner of Health

ALBANY, N. Y.

These rules and regulations to be operative and valid must first be published at least once each week for six consecutive weeks in at least one newspaper in Westchester county and the affidavit of the printer, publisher, or proprietor of each newspaper in which such publication is made, that the publication was so made, together with a copy of the rules and regulations, must be filed with the county clerk of that county.

The cost of each such publication, affidavit and filing must be paid by the village of Tarrytown.

WARWICK

Rules and regulations for the protection from contamination of the public water supply of the village of Warwick, Orange County.

RULES AND REGULATIONS

The rules and regulations hereinafter given, duly made and enacted in accordance with the provisions of sections 70, 71, 72 and 73 of chapter 45 of the Consolidated Laws (Public Health Law) as heretofore set forth shall apply to all natural and artificial reservoirs and all water courses tributary thereto or ultimately discharging into said reservoirs, these bodies of water being sources of the public water supply of the village of Warwick, Orange county, N. Y. The term "reservoir" wherever used in these rules is intended to mean and refer to all storage and impounding reservoirs which are tributary to or which serve as sources of this public water supply or to any additional reservoirs which may be constructed or used for the purpose of this public water supply. The term "watercourse" wherever used in these rules is intended to mean and include every spring, pond (other than the artificial reservoirs and filter basins), stream, ditch, gutter, or other channel of every kind the waters of which when running, whether continuously or occasionally, eventually flow or may flow into the public water supply of the village of Warwick.

Wherever a linear distance of a structure or object from a reservoir or from a watercourse is mentioned in these rules, it is intended to mean the shortest horizontal distance from the nearest point of the structure or object to the high water mark of a reservoir, or to the edge, margin or precipitous bank forming the ordinary high water mark of such watercourse.

Privies Adjacent to any Reservoir or Watercourse

1. No privy, privy vault, pit, cesspool or any other receptacle of any kind used for either the temporary storage or the permanent deposit of human excreta shall be constructed, placed, maintained, or allowed to remain within one hundred (100) feet of any reservoir or watercourse tributary to the public water supply of the village of Warwick.

2. No privy, privy vault, pit, cesspool or any other receptacle used for the permanent deposit of human excreta shall be constructed, located, placed, maintained or allowed to remain within three hundred (300) feet of any reservoir or watercourse tributary to the public water supply of the village of Warwick.

3. Every privy, privy vault, pit or other receptacle or place used for the temporary storage of human excreta which is constructed, located, maintained or allowed to remain between the limiting distances prescribed by Rule 1 and the limiting distances prescribed by Rule 2 from which privy or other receptacle the excreta are not at once removed by pump or other satisfactory means through watertight pipes or conduits to some proper place of ultimate disposal, as hereinafter provided, shall be arranged in such manner that all such excreta shall be received temporarily in suitable vessels or receptacles which shall at all times be maintained in an absolutely watertight condition and which will permit of convenient removal to some place of ultimate disposal as hereinafter set forth.

4. The excreta collected in the aforesaid temporary receptacles permitted under Rule 3 shall be removed and the receptacles thoroughly cleaned and deodorized as often as may be found necessary to maintain the privy in proper sanitary condition and to effectually prevent any overflow upon the soil or upon the foundations or floor of the privy. In effecting this removal the utmost care shall be exercised that none of the contents be allowed to escape while being transferred from the privy to the place of disposal hereinafter specified, and that the contents, while being transferred from the privy to the place of disposal, shall be thoroughly covered and that the least possible annoyance and inconvenience be caused to occupants of the premises and the adjacent premises.

5. Unless otherwise specially ordered or permitted by the State Department of Health, the excreta collected in the aforesaid temporary receptacles permitted under Rule 3 shall, when removed, be disposed of by burying in trenches or pits at a depth of not less than 18 inches below the surface and at some point off the watershed tributary to the public water supply of the village of Warwick.

6. Whenever, owing to the character of the soil or of the surface of the ground, or owing to the height or flow of subsoil or surface water, or other special local conditions, it is considered by the State Commissioner of Health that excremental matter from any privy or aforesaid receptacles, or from any trench or place of disposal or the garbage or wastes from any dump, may be washed over the surface or through the soil in an imperfectly purified condition into any reservoir or watercourse, then the said privy or receptacles for excreta or the trench or place of disposal or the said garbage or waste dump, shall, after due notice to the owner thereof, be removed to such greater distance or to such place as shall be considered safe and proper by the State Commissioner of Health.

Sewage, House Slops, Sink Waste, etc.

7. No house slops, bath water, sewage or other excretal matter from any water closet, privy, cesspool or other source shall be thrown, placed, led, conducted, discharged or allowed to escape or flow in any manner either directly or indirectly into any reservoir or any watercourse tributary to the public water supply of the village of Warwick, nor shall any such matters be thrown, placed, led, discharged or allowed to escape or flow onto the surface of the ground or into the ground beneath the surface, except into watertight receptacles, the contents of which are to be removed as provided by Rule 4 within three hundred (300) feet of any reservoir or watercourse tributary to the public water supply of the village of Warwick.

8. No garbage, putrescible matter, kitchen or sink waster, refuse or waste water from any creamery, cheese factory, laundry nor water in which milk cans, utensils, clothing, bedding, carpets or harnesses have been washed or rinsed, nor any polluted water or liquid of any kind shall be thrown or discharged directly or indirectly into any reservoir or watercourse, nor shall any such liquid or solid refuse or waste be thrown, discharged or allowed to escape or remain upon the surface of the ground or to percolate into or through the the ground below the surface in any manner whereby the same may flow into any reservoir or watercourse within a distance of two hundred (200) feet from any reservoir or watercourse tributary to the public water supply of the village of Warwick.

9. No clothing, bedding, carpets, harness, vehicle, receptacles, utensils, nor anything that pollutes water shall be washed, rinsed or placed in any reservoir or watercourse.

Bathing, Animals, Manure, Compost, etc.

10. No person shall be allowed to bathe in any reservoir or watercourse, nor shall any animals or poultry be allowed to stand, wallow, wade or swim in any reservoir or watercourse, nor be washed therein. The watering of animals or poultry in any reservoir of the public water supply of the village of Warwick is prohibited; nor shall any such watering be allowed in any watercourse tributary to this water supply within one thousand (1,000) feet of said reservoirs. No watering place shall be maintained in such a way as to pollute with muddy leachings or excretal matters any streams tributary to the public water supply of the village of Warwick.

11. No stable for cattle or horses, barnyard, hog yard, pig pen, poultry house or yard, hitching place or standing place for horses or other animals, manure pile or compost heap, shall be constructed, placed, maintained or allowed to remain with its nearest point less than one hundred and fifty (150) feet from any reservoir, or watercourse tributary to the public water supply of the village of Warwick and none of the above named objects or sources of pollution shall be so constructed, placed, maintained or allowed to remain where or in such a manner that the drainings, leachings or washings from the same may enter any such reservoir or watercourse without first having passed over or through such an extent of soil as to have been properly purified, and in no case shall it be deemed that proper purification has been secured unless the above drainings, leachings or washings shall have percolated over or through the soil in a scattered, dissipated form, and not concentrated in perceptible lines of drainage for a distance of not less than one hundred and fifty (150) feet from any reservoir or watercourse tributary to the public water supply of the village of Warwick.

12. No human excreta, compost or other matter containing same shall be thrown, placed or allowed to escape into any reservoir or watercourse, nor to be placed, piled or spread upon the surface of the ground at any point on the watershed tributary to the public water supply of the village of Warwick; nor shall such human excreta, compost or other matter containing the same be dug or buried in the soil at any point on the watershed tributary to the public water supply of Warwick, and no manure or compost of any kind shall be placed, piled or spread upon the ground within a distance of one hundred and fifty (150) feet from any reservoir or watercourse tributary to the public water supply of the village of Warwick.

13. No decayed or fermented fruit or vegetables, cider mill wastes, roots, grain or other vegetable refuse of any kind shall be thrown, placed, discharged or allowed to escape or pass into any reservoir or watercourse, nor shall they be thrown, placed, piled, maintained or allowed to remain in such places that the drainage, leachings or washings therefrom may flow by open, blind or covered drains or channels of any kind into any reservoir or watercourse without first having passed over or through such an extent of soil as to have been properly purified, and in no case shall it be deemed that sufficient purification has been secured unless the above mentioned drainings, leachings or washings shall have percolated over or through the soil in a scattered, dissipated form, and not concentrated in perceptible lines of drainage, for a distance of not less than one hundred (100) feet before entering any reservoir or watercourse tributary to the public water supply of the village of Warwick.

Dead Animals, Offal, Manufacturing Waste, etc.

14. No dead animals, bird, fish, or any part thereof, nor any offal or waste matter of any kind, shall be thrown, placed, discharged or allowed to escape or to pass into any reservoir or watercourse. Nor shall any such material or refuse be so located, placed, maintained or allowed to remain that the drainage, leachings or washings therefrom may reach any such reservoir or watercourse without having first percolated over or through the

soil in a scattered, dissipated form and not concentrated in perceptible lines of drainage for a distance of two hundred and fifty (250) feet from any reservoir or watercourse tributary to the public water supply of the village of Warwick.

Fishing, Boating and Ice Cutting

15. No boating of any kind, or fishing from boats or through the ice, or any trespassing whatever shall be allowed in or upon the waters or ice of the reservoirs tributary to the public water supply of Warwick. Neither shall any ice cutting be allowed from said reservoirs.

16. No temporary camp, tent, building or other structures for housing laborers engaged on construction work or for other purposes shall be located, placed or maintained within a distance of five hundred (500) feet from any reservoir or watercourse tributary to the public water supply of the village of Warwick.

Cemeteries

17. No interment of a human body shall be made within a distance of three hundred (300) feet from any reservoir or from any watercouse tributary to the public water supply of the village of Warwick.

18. The board of water commissioners of the village of Warwick shall make regular and thorough inspections of the reservoirs, streams and drainage areas tributary thereto for the purpose of ascertaining whether the above rules and regulations are being complied with and it shall be the duty of said board of water commissioners to cause copies of any rules and regulations violated to be served upon the persons violating the same with notices of such violations; and if such persons served do not immediately comply with the rules and regulations it shall be the further duty of the board of water commissioners to promptly notify the State Commissioner of Health of such violations. The board of water commissioners shall report in writing annually on the first of January, the results of the regular inspections made during the preceding year stating the number of inspections which have been made, the number of violations found, the number of notices served, and the general condition of the watershed at the time of the last inspection.

Penalty

19. In accordance with section 70 of chapter 45 of the Consolidated Laws (Public Health Law) the penalty for each and every violation of or noncompliance with, any of these rules and regulations which relate to a permanent source or act of contamination, is hereby fixed at one hundred (100) dollars.

The foregoing rules and regulations for the protection from contamination of the public water supply of the village of Warwick are hereby duly made, ordained and established on this seventh day of December, 1914, pursuant to chapter 45 of the Consolidated Laws (Public Health Law) of the State of New York, as amended by chapter 695 of the Laws of 1911.

LINSLY R. WILLIAMS
Deputy State Commissioner of Health

ALBANY, N. Y.

These rules and regulations to be operative and valid must first be published at least once each week for six consecutive weeks in at least one newspaper in Orange county and the affidavit of the printer, publisher or proprietor of each newspaper in which such publication is made, that the publication was so made, together with a copy of the rules and regulations, must be filed with the county clerk of that county.

The cost of each such publication, affidavit and filing must be paid by the village of Warwick.

INSPECTIONS OF VIOLATIONS OF RULES FOR THE PROTECTION OF PUBLIC WATER SUPPLIES

During 1914 inspections of violations of rules and regulations were made and the necessary orders to local boards of health issued in connection with the water supplies of the following municipalities: Avon and Geneseo, New Rochelle, Tarrytown.

In the case of Avon and Geneseo, out of ten violations reported, six were verified, one had been previously verified, for one no notice had been served and three were found abated. At New Rochelle one violation was verified and at Tarrytown eight violations were verified and the proper notices served.

ISSUANCE OF GENERAL ORDER REGARDING VIOLATIONS OF WATER SUPPLY RULES

In December, 1912, a general order was issued under section 71 of the Public Health Law, requiring the local officials in charge of the water supplies for which rules and regulations had been enacted to report in writing on the first day of January of each year the detailed results of the regular inspections of the sources of water supply and the steps taken to abate any violations found. A similar requirement has been embodied in all rules enacted since 1912.

When these reports of the water works officials are received they are carefully reviewed, and in cases where violations are reported as existing the necessary action for the abatement of such violations is taken by the engineering division.

Letters were sent in December, 1914, to the Board of Water Commissioners or water company at the places listed below calling attention to this requirement:

Altamont
Amsterdam
Auburn
Avon and Geneseo
Canastota
Cherry Valley
Chester
Cobleskill
Cold Spring
Corinth
Cornwall-on-Hudson
Cortland
Coxsackie
Deansboro
Delhi
Dolgeville
Elmira
Elmira Reformatory
Fort Edward
Fredonia
Glens Falls
Haverstraw
Highland Mills and Central Valley
Hornell
Hudson
Ilion
Ithaca
Ithaca, Cornell University
Kingston
Little Falls
Mechanicville
Middleburg
Middletown
Middleville
Monticello
Mt. Vernon
Newburgh
New Rochelle
Norwich
Nyack
Oneonta
Ossining
Peekskill
Penn Yan
Perry
Philmont
Plattsburg
Pleasantville
Port Jervis
Pulaski
Rochester
Rome
Saranac Lake
Saratoga Springs
Sherburne
Skaneateles
Suffern
Syracuse
Syracuse Suburban Water Co.
Tarrytown
Troy
Utica
Walton
Waverly
West Cartharge
Yonkers

SPECIAL INVESTIGATIONS OF PUBLIC WATER SUPPLIES

There are now approximately 420 public water supplies in the State for which rules and regulations have not been enacted by this Department. Although many of these supplies are derived from ground water sources which render the enactment of rules and regulations impracticable, the majority of these supplies are derived from surface sources.

It is evident that insanitary conditions must exist upon the watersheds of many of these supplies and that there is urgent need that steps be taken to discover and remedy such conditions which menace the quality of these water supplies. With this end in view the engineering division has undertaken the voluntary investigation of the various public water supplies throughout the State.

These special investigations involve careful field inspection, collection of samples of water for analysis and the preparation of reports which embody the results of such investigations together with conclusions and recommendations for improvements. Such reports are transmitted to the local authorities and in many cases marked improvements in the water supplies have been brought about as the results of these investigations.

EAST AURORA

An investigation of the public water supply of the village of East Aurora was made on February 5, 1914.

East Aurora is an incorporated village of about 3000 inhabitants in the central part of Erie county, about 17 miles southeast of Buffalo on the Buffalo division of the Pennsylvania railroad. The village is chiefly residential and, with the exception of the Roycroft shops, there are practically no industries. During the summer months the population reaches about 4,000 owing to the presence of many visitors and tourists.

The village has recently completed a system of sanitary sewers with a disposal plant and an ordinance has been passed requiring all houses in the village to be connected with this system by July, 1914.

The water works are owned and operated by the village under the direction of the board of trustees, of which Mr. Alfred Brotherhood is president. The works were constructed in 1890 after the plans and under the direction of the village authorities. In 1907 wells were driven and an additional pumping station constructed in order to supplement the original supply. The original supply is derived from springs about three-quarters of a mile southwest of the village center. The supplementary supply is located about one mile north of the village. The original supply is known as the South street supply and the other as the Pine street supply.

It is estimated that at least 2,500 persons are supplied by the public water works or about 85% of the population. There are about 850 service taps, of which 450 are metered. No accurate records of water consumption are available. The distribution system consists of 15 miles of mains, 10 miles of which are of wood and the remaining 5 miles of cast-iron, the sizes ranging from 4 to 10 inches. The water is distributed by pumping and the average pressure in the village is about 50 pounds.

The South street supply comes from four springs at the foot of a steep bank and from which the water flows through 1,000 feet of 12-inch pipe to a collecting reservoir. From this reservoir the water is pumped to the village mains. At each spring a covered wooden box, about 1½ feet wide, 6 feet long and 4 feet deep, is sunk about 3 feet below the surface of the ground. The water enters these boxes through numerous holes drilled in the sides and is carried off through an outlet pipe to the main collecting pipe. The reservoir which receives this spring water has earthen embankments lined on the inside slopes with masonry and with a concrete bottom. Its dimensions are approximately 45 feet by 135 feet, with an average depth of water of 8 feet and an estimated capacity of about 500,000 gallons. Near this reservoir is the pumping station, which is a wooden building about 15 feet by 20 feet, containing a Holley duplex pump geared to two water wheels. The capacity of this pump is 1,000,000 gallons per 24 hours, with a suction lift of 6 feet and pumping against a head of 200 feet. The water wheels are run by water stored behind a small dam in the east branch of Cazenovia creek.

The Pine street supply comes from 17 driven wells in a glacial plain, near a small pond known as Sinking pond. The wells are 2½-inch wrought iron pipe, 28 feet deep, ending in a strainer, and connected at the top to a 10-inch suction line from the pumps. The wells are very close to each other and do not cover an area more than 30 feet square. The pumping station is part wood and part concrete blocks about 40 feet by 75 feet. The pumping equipment consists of one Snow horizontal duplex plunger pump (10″ by 16″ by 10″ by 12″), capacity 720,000 gallons per 24 hours, and one Worthington pump (12″ by 17″ by 11″ by 15″), capacity 1,500,000 gallons per 24 hours. The suction lift is about 10 feet and the total head against which pumping takes place is about 130 feet. The pumps are driven by steam generated in two boilers of 50 H. P. and 75 H. P., respectively. Two engineers are employed regularly to operate the pumping station, besides a superintendent who has general charge of the water works system.

East of the village on a side hill is an overflow or pressure maintaining reservoir which receives excess pumpage and which tends to keep uniform pressure in the village mains. This reservoir has earthen embankments lined on the inside with masonry covered with cement plaster and with a concrete bottom. This reservoir is approximately 75 feet by 100 feet, with 8 feet depth of water. This reservoir, as well as the collecting reservoir at the South street station, is uncovered. Both reservoirs are protected from surface wash by drainage ditches and are fenced off by wire fences. The reservoirs are cleaned once a year, in the spring.

The inspection of the water supply was made by Mr. E. S. Chase, assistant engineer in this Department, in response to a letter from the health officer, Dr. E. W. Buffum, in which it was stated that some trouble had been experienced from tastes and odors in the water and that there had been several diarrheal cases in the village. The assistant engineer was accompanied in this inspection by Dr. Buffum and Mr. Alfred Brotherhood, village president.

The surface drainage area contributory to the South street springs is approximately three-quarters of a square mile, although it is impossible to state the extent of the underground contributory area. While there are few dwellings near the springs, a large portion of the village is upon the surface watershed and undoubtedly the spring water comes from beneath a well-populated area. At the top of the bank from which the springs issue is a street and in this street is laid a sewer. This sewer is probably about 10 feet higher than the springs and about 50 feet distant. One side the land, upon which the springs are located, is fenced off, but on the other sides there are no fences. The springs are thus easy of access and danger of their contamination by trespassers is very apparent, since a small picnic ground is located a few hundred feet away. The wooden boxes at the springs are in a rather poor state of repair and the covers are not locked. Surface ditches, filled with loose stone, drain to some of the springs and it is evident that at times of rainfall surface wash can easily contaminate the springs.

The surface drainage area at the Pine street wells is about one square mile. There are only four or five houses on this area and the nearest one is at least 600 feet from the wells. At the pumping station itself a privy is located about 30 feet from the wells. About 100 feet east of the station is Sinking pond, a small spring-fed pond of about four acres and of unknown depth. Since the pumping station has been in operation this pond has had its water level gradually lowered. On the west of the station is a level area of one or two hundred acres, which has formerly been very swampy, usually with standing water. This past summer no water has stood on this plain and it has been put under cultivation for the first time. The water in the wells stands usually about eight feet below the ground surface, but during the past summer and following the prolonged drought, when this station was used continuously for about two months, the water level in the wells became as low as 19 feet below the surface.

The bottom of Sinking pond is covered to an unknown depth with a pink deposit of the consistency of quicksand and containing numerous small shells of fresh water snails. This deposit is said to be over 20 feet deep in places and opposite the pumping station it is within 2 or 3 feet of the surface. This material gives off a putrefactive odor, and it is said that during the fall similar odors were noticed in the village water supply, especially from boiled or boiling water. During the summer the pond becomes covered with a growth of moss-like grass. This material has a decided vegetable or grassy odor unlike the odors noticed in the village water.

Some complaint had been made of the turbidity of the village water after unusual drains had been placed upon the supply, as in the case of fires. At the time of the inspection, a fire hydrant was opened and flushed. The water was decidedly turbid with a reddish brown material which rapidly settled out on standing. This material was undoubtedly iron rust caused by the corrosion of the water pipes. Accumulations of this rust could probably be prevented by more frequent flushing of the water mains.

At the time of the inspection samples of water for bacteriological analysis were collected at each pumping station, from a tap in the village and from Sinking pond. A sample of water for chemical analysis was also collected from the tap in the village. On February 10, chemical samples were collected by Dr. Buffum from each pumping station and from Sinking pond and a sample of the deposit from the pond was taken and sent to this Department by Mr. Brotherhood. The results of the analysis of these chemical and bacterial samples as well as those made in the past by the State Hygienic Laboratory are shown in the appended table.

The past samples, taken from taps in the village, are probably mixtures of varying proportions of water from both sources and this probably explains variations in the chemical results. The characteristics of the water from each supply is shown by a single set of comparative analyses. These analyses show that both waters are very hard and practically clear and colorless The figures for free ammonia are somewhat high for ground waters and those for albuminoid ammonia are only moderately low. The South street supply contains higher amounts of nitrogenous organic matter than the Pine street supply, more nitrates and much more chlorine. These higher amounts of free and albuminoid ammonia are probably due to some admixture of surface water, while the higher nitrates and chlorine are due to past contamination from the subsurface drainage from the well-populated section. The figures on the whole show that whatever contamination has taken place of the spring water in the past, the passage of the water through the soil had rendered it well mineralized and passive. The past analyses do not give definite information regarding any particular supply, although they indicate that the whole supply as a rule contains little active pollution. The occasional presence of organisms of the B. coli type indicates some active contamination from animal or human sources at times. The inspection would lead to the opinion that this contamination came from surface wash reaching the springs after rains. The bacterial counts are moderate as a rule. The high counts and the occurrence of B. coli in the samples taken in 1911 from the reservoir were probably due to contamination of the reservoir by surface wash during a heavy rain storm.

The analyses of the water from Sinking pond show that this water is considerably different from that from the Pine street wells at the time the samples were taken. While undoubtedly some of this pond water reaches the wells, under the present conditions, it becomes thoroughly purified by passing through the sand and gravel before it reaches the wells. It is entirely possible, that under different hydrostatic conditions of the ground water, and with the water level in the wells lowered considerably below the surface of the pond, that the rate of filtration through the sand and gravel would be too fast to adequately purify the water.

A microscopical examination of the deposit from the bottom of Sinking pond showed that this deposit is composed largely of microscopic vegetable organisms called diatoms. These organisms have coverings of silica which surround the living organic protoplasm. Upon the death of these organisms decomposition of the organic portion of their structure takes place, but the sheaths or skeletons of silica remain behind, forming deposits. In time, after these deposits have become very deep and after the organic matter has completely decomposed, diatomaceous or "Fuller's" earth is formed. It is the decomposition of the organic matter which gives rise to some of the disagreeable odors from the deposit. At times when the wells at the Pine street station are being drawn upon heavily it is possible that some of the products of decomposition may pass through the sand and gravel into the well water. It is also possible that some of the microorganisms may have become seeded in the pressure reservoir or in the water mains. These microorganisms cannot be considered as constituting a specific danger to public health even should they become prevalent in the water supply, although it is not impossible that minor intestinal troubles might be caused in persons of weak constitution or among invalids and children. The greatest objection to these microscopic organisms is from the esthetic standpoint, due to odors and tastes.

The conclusions developed in the above report may be summarized as follows:

1. That the mixed supply as received in the village has been in the past of fair sanitary quality, but at times the analyses have shown some active contamination.
2. That the supply derived from the South street springs has been subject to considerable past pollution, ordinarily well purified and mineralized, but that at times this supply has been actively contaminated, probably from surface wash, due to the poor protection of these springs from surface run-off and that this supply is probably responsible for the occasional presence of evidence of active contamination in the mixed supply.
3. That the sewer recently laid in South street, near the springs, constitutes a constant menace to the purity of the water from these springs, due to the possibility of leaks in the sewer.
4. That the supply from the Pine street station is of reasonable sanitary quality, although at times of heavy pumping, subject to tastes and odors derived from microorganisms or their products, drawn through the sand and gravel from the deposits in Sinking pond; but that these tastes and odors are chiefly objectionable from being offensive to the esthetic sense.

5. That the privy at the Pine street station is too near the wells and not properly maintained.

6. That, owing to the lack of or insufficient flushing of the mains, accumulations of iron rust formed by the corrosion of the iron pipe occur at times and at certain points in the system. These accumulations during times of heavy draft become stirred up and cause marked turbidity in the water.

In view of the above conclusions I beg to submit the following recommendations:

1. That on account of the reported evidence of past contamination of the water from the South street springs and the possibility that this past contamination has at times become active under certain hydraulic conditions of the ground water and also in view of the added danger of contamination resulting from leakage from the sewer above the springs, the village authorities consider at once an additional supply of satisfactory quality from some other source, well removed from possible contamination and the complete abandonment of the South street springs.

2. That, pending the acquirement of a new supply, the South street springs be protected as much as possible from wilful or accidental contamination by fencing off thoroughly the land upon which the springs are located. Furthermore, the wooden spring boxes should be placed in repair and provided with tight covers which should be kept locked, and drains or ditches should be dug so as to protect the springs from surface wash.

3. That the privy at the Pine street station be provided with a watertight removable container, the contents of which should be disposed of, as often as necessary, by burying in the soil in a suitable place off the watershed.

4. That the village authorities be advised to retain the services of a competent water supply engineer to advise them in respect to the proper sources and methods for obtaining a sufficient and satisfactory additional water supply.

ALBANY, N. Y., *Feb.* 24, 1914

ANALYTICAL DATA OF WATER SUPPLIES

Abbreviations used to describe odors of water: 0, none; 1, very faint; 2, faint; 3, distinct; 4, decided; 5, strong; 6, very strong; a, aromatic; d, disagreeable; e, earthy; f, fishy; g, grassy; m, musty; v, vegetable

Municipality	County	Source	Date of collection	PHYSICAL				CHEMICAL (PARTS PER MILLION)											BACTERIOLOGICAL			
						ODOR		SOLIDS			NITROGEN AS —						HARDNESS			B. COLI TYPE + = PRESENT — = ABSENT		
				Color	Turbidity	Cold	Hot	Total	Loss on ignition	Mineral residue	Free ammonia	Albuminoid ammonia	Nitrites	Nitrates	Oxygen consumed	Chlorine	Total	Alkalinity	Bacteria per c.c.	10 c.c.	1 c.c.	1-10 c.c.
East Aurora	Erie	Tap in residence	5/21/08	Tr.	Tr.	....	....	298	....	....	Tr.	.010	.001	2.40	0.15	8.75	177.2	159.0	425	+	+	....
East Aurora	Erie	Tap, public supply	3/ 8/09	Tr.	Cl.	....	....	280	40	240	.070	.118	.004	0.80	0.30	5.75	228.5	171.0	50	—	—	....
East Aurora	Erie	Tap, public supply	2/15/10	Tr.	Cl.	....	....	338	64	268	.006	.010	.010	0.20	0.60	4.00	221.5	196.0	300	—	—	—
East Aurora	Erie	Tap, public supply	5/28/10	Tr.	Cl.	....	....	304	46	258	.024	.014	.005	Tr.	0.95	3.25	221.5	208.0	15	—	—	—
East Aurora	Erie	Tap, public supply	10/13/10	Tr.	1	....	....	280	44	236	.002	.026	.001	Tr.	0.90	3.00	214.3	200.0	10	—	—	—
East Aurora	Erie	Tap, public supply	3/ 1/11	Tr.	Cl.	....	....	295	72	223	.054	.016	.050	0.50	0.50	6.25	114.5	187.0	1,200	+	—	—
East Aurora	Erie	Reservoir (north end)	2/ 9/11	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	900	+	—	—
East Aurora	Erie	Reservoir (south end)	9/ 9/11	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	400	+	+	—
East Aurora	Erie	Reservoir (west end)	9/ 9/11	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	6,200	+	+	+
East Aurora	Erie	Reservoir (east end)	9/ 9/11	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	4,400	+	+	+
East Aurora	Erie	Tap, public supply	9/21/11	Tr.	Cl.	....	....	265	36	229	.010	.024	.001	Tr.	0.30	2.50	221.5	208.0	3,100	+	—	—
East Aurora	Erie	Tap, public supply	12/11/11	2	Cl.	....	....	334	24	310	.020	.026	.001	0.02	0.52	3.12	235.5	201.0	1,200	—	—	—
East Aurora	Erie	Tap, public supply	2/26/12	Tr.	Cl.	1 v.	1 v.	299	40	259	.006	.022	.003	2.80	0.30	11.25	185.8	163.0	500	1+2—	0+3—	0+3—
East Aurora	Erie	Tap, public supply	4/ 8/12	3	5	1 v.	1 v.	310	50	260	.006	.042	.003	3.00	0.50	10.25	177.2	168.0	650	2+1—	0+3—	0+3—
East Aurora	Erie	Tap, public supply	9/23/12	Tr.	Tr.	1 v.	1 v.	312	31	281	.002	.002	.001	0.02	0.80	3.25	228.5	210.0	1,500	0+3—	0+3—	0+3—
East Aurora	Erie	Tap, public supply	11/14/12	Tr.	Cl.	1 v.	1 v.	278	26	252	.008	.022	Tr.	0.02	1.00	3.50	221.5	200.0	300	0+3—	0+3—	0+3—
East Aurora	Erie	Tap, public supply	12/15/12	Tr.	Cl.	1 v.	1 v.	292	24	268	.016	.032	Tr.	0.02	0.70	3.00	221.5	210.0	230	0+3—	0+3—	0+3—
East Aurora	Erie	Tap, public supply	1/27/13	Tr.	Cl.	1 v.	1 v.	320	....	....	.006	.034	.003	3.20	0.70	11.50	208.0	181.0	600	1+2—	1+2—	0+3—
East Aurora	Erie	Tap, public supply	4/ 7/13	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	20	0+3—	0+3—	0+3—
East Aurora	Erie	Tap, public supply	5/26/13	Tr.	Cl.	1 v.	1 v.	308	....	....	.004	.014	.002	1.40	0.60	8.00	221.5	188.0	250	0+3—	0+3—	0+3—
East Aurora	Erie	Tap, public supply	7/14/13	Tr.	Cl.	1 v.	1 v.	311	....	....	.004	.014	Tr.	0.02	0.70	3.25	228.5	203.0		0+3—	0+3—	0+3—
East Aurora	Erie	Tap, public supply	2/ 5/14	2	Cl.	1 v.	1 v.	408	36	372	.008	.012	.003	0.02	1.10	3.75	300.0	207.0	30	0+3—	0+3—	0+3—

East Aurora	Erie	South street pumping station	2/ 5/14	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	110	0+3—	0+3—	0+3—
East Aurora	Erie	Tap, Pine street pumping station	2/ 5/14	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	30	0+3—	0+3—	0+3—
East Aurora	Erie	Skating pond, near Pine street pumping station	2/ 5/14	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	6,100	3+0—	2+1—	0+3—
East Aurora	Erie	Skating pond, near Pine street pumping station	2/10/14	30	5	1 m.	1 m.	320	44	276	1.59	426	.003	0.06	15.2	3.00	227.0	156.0	....	....	....	....
East Aurora	Erie	Tap, Pine street pumping station	2/10/14	12	3	v.	1 v.	493	45	448	.018	062	.008	0.20	1.35	3.75	350.0	218.0	....	....	....	....
East Aurora	Erie	Tap, South street pumping station	2/10/14	Tr.	Tr.	v.	1 v.	435	61	374	.032	036	.002	0.80	1.25	8.38	357.0	207.0	....	....	....	....

* Delayed in transit.

Copies of the above report were transmitted to the local board of trustees and to Dr. E. W. Buffum, health officer.

FORT EDWARD

An investigation of the public water supply of the village of Fort Edward was made on December 3, 1914.

Fort Edward is an incorporated village with a population of about 4,000, located in the western part of Washington county, on the east bank of the Hudson river, about 50 miles north of Albany. It is on the main line of the D. & H. R. R. The principal industry in the village is that of paper manufacturing and one mill of the International Paper Company is located here. The village is provided with a public sewer system which discharges into the Hudson river.

The public water supply is obtained from an impounding reservoir which conserves the waters from various springs and from a small brook. This reservoir is located on the west side of the river about three miles from the village. The water works were designed by Stephen Babcock, C. E., and constructed under his direction by contract in the year 1893. They are owned and operated by the village under the direction of the board of trustees, of which Mr. Joseph Brown is president.

Practically the entire population is served by the public water supply and although no data are available respecting the average daily consumption it may be estimated as approximately 500,000 gallons. Considerable quantities of water are used by the industries in the village. The water is distributed by gravity through several miles of cast-iron pipe ranging from 4 to 20 inches in diameter. There are 915 service taps, of which only 60 or 70 are metered. The average pressure in the center of the village is about 64 pounds per square inch, although on the outskirts, in the hill district, the pressure does not exceed 38 pounds. At times of emergency in the past, such as fires or lack of water in the reservoir due to drought, additional water has been obtained by pumping directly from the Hudson river by pumps located in the International Paper Company mill. At present it is stated that the valve between the mill system and the public system is closed. Water has also been obtained from the Hudson Falls water system, which adjoins the village on the north.

The reservoir is formed by a low earthen dam with inner slopes riprapped. This reservoir is divided into two parts by a highway, the lower part is 875 feet long with an average width of about 150 feet and the upper part is 425 feet long and about 75 feet in width. The total area is about 4 acres, the maximum depth 17 feet and the total capacity about 11,400,000 gallons. A 10-inch mud pipe allows stagnant water in the bottom of the reservoir to be blown off if necessary.

The intake is located at the highway separating the two parts of the reservoir. At this point there is a brick gate-house containing valves for the control of the flow. The intake chamber is divided into three compartments. The first contains two sets of screens of about one-quarter inch mesh and is also filled with broken stone or gravel. The second compartment is a coke filter bed 15 x 12 x 10, while the third compartment is a clear water well from which a 20-inch line extends to the village. The water is taken from the upper end of the lower reservoir at a point near the shore and near the highway.

The total surface water shed tributary to this reservoir is approximately 0.7 square miles. This watershed is a level sand or gravel plain with very few trees and almost worthless for agricultural purposes. The surface stream which feeds the reservoir is very small and it is evident that a large amount of the water impounded in the reservoir must be derived from springs. At the time the works were installed it was estimated that a daily flow of 1,000,000 gallons was available from the springs and stream.

The inspection was made by Mr. E. S. Chase, assistant engineer, in accordance with the policy of this Department of making voluntary inspections of the various public water supplies in this State. The assistant engineer was accompanied and aided in this inspection by Dr. George M. Glenn, health officer of Fort Edward.

There are only three dwellings with accompanying barns and outbuildings located on the watershed. Two of these houses are located over a mile from the reservoir and no stream flows anywhere near them. There would seem to be absolutely no possibility of contamination from these two places. The third house is that of the caretaker at the reservoir and is located 200 feet from it. The slope of the land is gradual from the house toward the reservoir. The privy is provided with a removable container, although the manner of disposal of the contents could not be ascertained at the time of the inspection as the caretaker was not present. The general sanitary condition around the premises appeared to be very good. As far as could be determined, there are no permanent sources of contamination of this water supply save from the surface wash from the vicinity of the caretaker's house and from the small strip of highway passing between the two parts of the reservoir. This highway is very little traveled and the amount of contamination occurring from it would be very slight. The location of the intake so close to this highway, however, renders any accidental or wilful contamination from passersby at this point decidedly serious, although, as noted above, the visitors to the vicinity of the reservoir must be very few in number.

The reservoir is fenced off and a sign warning against contamination of the reservoir is posted in a conspicuous place. Furthermore, the caretaker is supposed to act as a watchman and prevent trespassing. Rules and regulations for the protection of this supply from contamination were enacted in 1893. Regular inspection of the watershed is made by the board of trustees as required by this Department although this inspection is said to be made only once yearly.

At the time of the inspection there seemed to be considerable leakage from the reservoir below the dam and, from a consideration of the soil and topographic conditions at the reservoir, it would appear somewhat difficult to prevent this waste. Under ordinary conditions this waste is probably of no serious consequence, but at times of drought it must be a serious loss to the water supply. It would seem reasonable to assume that were this leakage conserved at times of low water it would be unnecessary to obtain additional supply from such a dangerous source as the Hudson river. This leakage might be utilized by the construction of a small masonry reservoir or basin just below the dam and the installation of pumping apparatus in order that this water now going to waste could be pumped into the main leading to the village. It would of course be unnecessary to carry on this pumping save at times of drought or other emergency.

There is also the possibility of leaks or breaks occurring in the 20-inch supply main as it crosses under the river. This might occasion the entrance of river water into the main during the repairs.

It is stated that fishy tastes and odors have been noticed in the water, especially at times when the reservoir was drawn down. These tastes and odors were probably due to growths of algae, although no attempts have been made to control them by the use of copper sulphate or other chemical. Such tastes and odors, while objectionable from an aesthetic standpoint, cannot be considered injurious to health.

At the time of the inspection a sample of the village water was collected and the result of the analysis of which together with others made in the past by the Division of Laboratories and Research may be found in the appended table. These analyses show a water moderately high in color, slightly turbid at times and comparatively soft. The figures for nitrogen in the form of free and albuminoid ammonia and also for oxygen consumed are somewhat variable, probably due to fluctuations in the proportion of ground and surface water present in the supply. The amounts of oxidized nitrogen in the form of nitrites and nitrates are fairly low, although affording evidence of comparatively small amounts of past organic pollution.

Chlorine, the index of past pollution, varies from normal to three times the normal amount found in uncontaminated waters of this region, although as a rule the chlorine figure is slightly higher than normal. The bacterial counts are in several cases very high, although in the majority of samples the counts are moderate. The same is true of the presence of organisms of the B. coli type and in those cases where the total counts are high, B. coli are shown present in quantities of the samples as small as 1 c.c and occasionally 1/10 c.c. This would indicate that at times concentrated active contamination takes place and while no data is available as to the exact times at which pumping from the Hudson river was resorted to, it appears very probable that this concentrated contamination in the past has occurred at such times.

In view of the foregoing facts, the following conclusions may be drawn:

1. That the regular source of water supply of Fort Edward is comparatively free from opportunities for serious contamination, although two possible sources of contamination exist, namely:
   (a) The caretakers' dwelling near the reservoir, and
   (b) The highway passing between two parts of the reservoir.
2. That the leakage from the dam and reservoir does not allow the proper conservation of the water supply, thus necessitating at times the pumping of raw Hudson river water directly into the mains.
3. That the practice of using the highly polluted river water is a most dangerous menace to the health of the community and whenever resorted to may result in a serious outbreak of typhoid fever.

I would therefore recommend:

1. That the caretakers' house and out-buildings be moved from their present location to some point off the watershed, this being easily accomplished by moving them a few hundred feet to the east of the reservoir.
2. That the danger of surface wash and of accidental or wilful contamination from the highway crossing the reservoir be lessened by the following methods:
   (a) Extending the intake so that water can be taken from the extreme southern end of the reservoir near the dam, and
   (b) Constructing proper drainage ditches to carry road wash to the east of the reservoir in order to discharge such wash off the watershed, or
   (c) Changing the course of this highway by diverting it to the south around the dam so that it will not cross the reservoir.
3. That steps be taken at once to study the problem of securing a supply adequate at all times and under all conditions so that the extremely dangerous practice of supplementing the supply with raw river water may be avoided in the future.
4. That this problem of an adequate supply is a matter which can best be worked out by an expert sanitary engineer employed by the village and his study should include:
   (a) The possibility of conserving the present supply by the prevention of leakage at the dam and reservoir and the prevention of waste in the village.
   (b) The securing of a sufficient additional supply from a new and satisfactory source.

ALBANY, N. Y., *December* 21, 1914

RESULTS OF WATER ANALYSES

Abbreviations used to describe odors of water: 0, none; 1, very faint; 2, faint; 3, distinct; 4, decided; 5, strong; 6, very strong; a, aromatic; d, disagreeable; e, earthy; f, fishy; g, grassy; m, musty; v, vegetable

				PHYSICAL				CHEMICAL (PARTS PER MILLION)										BACTERIOLOGICAL			
						ODOR		SOLIDS			NITROGEN AS —						HARDNESS			B. COLI TYPE + = PRESENT — = ABSENT		
Municipality	County	Source of sample	Date of collection	Color	Turbidity	Cold	Hot	Total	Loss on ignition	Mineral residue	Free ammonia	Albuminoid ammonia	Nitrites	Nitrates	Oxygen consumed	Chlorine	Total	Alkalinity	Bacteria per c.c. Gelatin 20° 48 hours	10 c.c.	1 c.c.	1-10 c.c.
Fort Edward	Washington	Tap, municipal supply	8/ 1/07	....	2	....	....	55	....	....	.018	.052	.002	0.18	0.95	0.25	19.5	......	130	+	—	—
Fort Edward	Washington	Tap, municipal supply	5/ 5/08	13	1	....	....	38	....	....	.024	.088	Tr.	0.14	2.70	0.75	19.5	11.0	130	—	—	—
Fort Edward	Washington	Tap, municipal supply	7/31/08	1	Tr.	....	....	41	....	....	.034	.016	.003	0.24	0.70	0.37	12.7	10.0	110	—	—	—
Fort Edward	Washington	Tap, municipal supply	1/ 5/09	1	Cl.	....	....	36	11	25	.064	.034	.001	0.36	1.00	0.62	22.1	9.0	130	—	—	—
Fort Edward	Washington	Tap, public supply	2/ 4/10	1	Cl.	....	....	36	18	18	.006	.008	.001	0.40	1.00	0.50	14.3	......	250	—	—	—
Fort Edward	Washington	Tap, public supply	9/13/10	Tr.	Cl.	....	....	32	14	18	.056	.060	.001	0.12	0.50	0.25	16.9	15.0	23,000	+	+	—
Fort Edward	Washington	Tap, public supply	12/28/10	....	....	....	....	....	....	....	....	....	....	....	....	......	......	......	180	+	—	—
Fort Edward	Washington	Tap, public supply	2/ 7/11	....	....	....	....	....	....	....	....	....	....	....	....	......	......	......	100	+	—	—
Fort Edward	Washington	Tap, public supply	4/27/11	5	Tr.	....	....	42	17	25	.004	.028	.003	0.20	2.40	0.63	12.7	12.0	90	+	—	—
Fort Edward	Washington	Tap, public supply	7/ 6/11	5	....	....	....	28	10	18	.016	.026	.001	0.30	1.40	0.75	16.9	13.0	200	+	—	—
Fort Edward	Washington	Tap, public supply	8/31/11	10	10	....	....	47	10	37	.008	.020	.001	0.40	2.30	1.25	22.1	21.0	950	+	+	+
Fort Edward	Washington	Tap, public supply	10/ 3/11	Tr.	Cl.	....	....	40	9	31	.008	.032	.002	0.20	0.95	0.50	18.2	14.0	200	+	+	—
Fort Edward	Washington	Tap, public supply	11/ 9/11	15	Tr.	....	....	50	18	32	.016	.038	.001	0.24	2.20	0.50	18.2	15.0	275	+	+	—
Fort Edward	Washington	Tap, public supply	12/14/11	Tr.	Cl.	....	....	47	22	25	.008	.034	.002	0.24	1.00	1.00	19.5	15.0	20	+	—	—
Fort Edward	Washington	Tap, public supply	1/30/12	Tr.	Cl.	....	....	41	19	22	.018	.020	Tr.	0.72	0.10	0.50	15.6	13.0	60	+	—	—
Fort Edward	Washington	Tap, public supply	3/ 7/12	....	....	....	....	....	....	....	....	....	....	....	....	......	......	......	600	+	—	—
Fort Edward	Washington	*Tap, public supply	3/12/12	Tr.	Cl.	....	....	40	7	33	.024	.028	Tr.	0.36	0.60	0.75	16.9	5.0	80	+	—	—
Fort Edward	Washington	Tap, public supply	4/19/12	15	5	....	....	35	11	24	.012	.056	.001	0.14	1.90	0.50	16.9	11.0	100	—	—	—
Fort Edward	Washington	Tap, public supply	9/17/12	40	5	....	....	67	15	52	.004	.102	.001	0.26	9.00	0.75	19.5	13.0	3,600	+	+	+
Fort Edward	Washington	Tap, public supply	11/13/12	10	Cl.	....	....	37	11	26	.012	.034	.001	0.36	1.90	0.25	15.6	15.0	120	+	—	—
Fort Edward	Washington	Tap, public supply	12/28/12	10	Cl.	....	....	39	16	23	.028	.056	.001	0.34	1.80	0.50	14.3	14.0	80	—	—	—
Fort Edward	Washington	Tap, public supply	2/18/13	Tr.	Cl.	2 a.	2 a.	44	....	....	.016	.038	Tr.	0.24	0.70	0.75	14.3	13.0	70	0+3—	0+3—	0+3—
Fort Edward	Washington	Tap, public supply	4/24/13	10	2	1 v.	1 v.	63	....	....	.020	.038	Tr.	0.14	2.00	0.75	18.2	10.0	100	0+3—	0+3—	0+3—
Fort Edward	Washington	Tap, public supply	6/27/13	8	2	1 v.	1 v.	43	....	....	.004	.040	.001	0.18	1.10	0.50	14.3	14.0	250	3+0—	2+1—	0+3—
Fort Edward	Washington	Tap, public supply	4/ 9/14	17	Tr.	1 a.	1 a.	38	15	23	.012	.046	Tr.	0.18	3.30	0.50	15.6	11.0	120	1+2—	0+3—	0+3—
Fort Edward	Washington	Tap, public supply	12/3/14	12	Tr.	1 v.	1 v.	42	16	26	.004	.008	.001	0.16	2.60	0.50	14.3	13.0	40	0+3—	0+3—	0+3—

* Taken by health officer, who states there had been a shortage of water and water had been pumped into mains. Had been lots of stomach trouble.

Copies of the above report were transmitted to the local board of trustees, to Dr. G. M. Glenn, health officer, and to Dr. Charles S. Prest, sanitary supervisor.

GENEVA

An inspection of the water purification plant of the city of Geneva was made on April 1, 1914.

Geneva is a city of about 14,000 population situated in the eastern part of Ontario county, at the northern end of Seneca lake. The Auburn and the Pennsylvania branches of the New York Central and Hudson River R. R. and the Ithaca and the Buffalo branches of the Lehigh Valley R. R. pass through the city. A complete report in respect to the general sanitary condition of this city can be found in the Thirtieth Annual Report of this Department, Vol. II, page 725. This report was made by Prof. H. N. Ogden, special assistant engineer, in connection with his inspections of the cities of this State.

The public water supply of Geneva is derived from Seneca lake, about three miles south of the city center. The water works are owned by the city and are operated under the direction of the Board of Public Works, of which Mr. Walter Howard is president. Previous to January of the present year the water supplied to the city has been unpurified but since the middle of January the new purification works have been in operation. The population now served by the public supply is estimated at 13,000, or nearly the entire population of the city. The distribution system consists of nearly 40 miles of cast-iron mains ranging in size from 1 to 30 inches. Of the 3,100 service taps in the city about 3,000 are metered. The average daily consumption is 1,700,000 gallons, or 130 gallons per capita. The average pressure in the mains is 90 pounds per square inch.

During the past three years the city has expended over $150,000 in extensions and improvements to the water supply. Mr. Wm. S. Johnson of Boston, Mass., has been consulting engineer for these improvements. The following table gives a list of these improvements together with the approximate cost of each item.

Distributing reservoir and site	$19,000
Twenty-inch force main	48,000
Filters and clear water basin	33,000
Pumps	15,000
Boilers	2,500
Extensions to pumping station and boiler house	16,500
Thirty-inch intake line and crib	21,000
	$155,000

The new intake consists of a 30-inch cast-iron pipe extending about 570 feet from the shore into the lake. The depth of water at the end of this line is 20½ feet and the bottom of the lake at this point is said to slope abruptly into much deeper water. A cribwork of timber, 10 feet high, 22 feet square on the bottom and 9 feet square at the top, protects the end of the pipe. The end of the pipe at the crib is a few feet above the bottom of the lake and is further protected by a coarse screen inside the crib.

From the intake the water flows into a pump well divided into two compartments by a half-inch mesh wire screen. After passing through the screen the water is pumped to the filters. There are two low lift centrifugal pumps for this purpose, each with a capacity of 2,000 gallons per minute. Under the present conditions of water consumption but one of these pumps is required.

The two filters are each $\frac{202}{1000}$ of an acre in area and are covered by a groined arch concrete roof. These filters are each 66 feet 8 inches wide and 135 feet long and are located side by side, separated by a concrete division wall. Each filter is of the slow sand type and consists of 4.25 feet of fine sand over about 14 inches of gravel, underdrained by a system of lateral tiles connecting with the main effluent line which runs lengthwise through the center of the filter floor. No data are available as to the effective size and uniformity coefficient of the sand in these filters, but from its appearance it seems to be fine grained and well adapted for filtration purposes. With the present rate of filtration, which is 4,200,000 gallons per acre per day, the water level on the filters is 4 feet. The rate of filtration can be regulated by hand operated valves on the inlet and outlet pipe lines, the amount of water filtered by each unit being measured by Venturi meters in each effluent line. The loss of head in passing through the filters will be measured by floats and indicators showing water levels before and after filtration. This apparatus at the time of inspection had not been adjusted.

On account of the short period of time during which the filters have been operated and also on acount of the comparative freedom of the raw water from turbidity there has been no occasion to clean the filters. It is expected that it will not be necessary to clean the filters frequently and that when it is necessary it will be more economical to remove the dirty sand and discard it without washing, replacing it by new clean sand.

The effluents flow over weirs from receiving wells in the control house into the clear water basin which is situated between the filters and the pumping station. This basin is a covered, concrete reservoir, 67 feet wide, 108 feet long and 12½ feet deep, with a capacity of 490,000 gallons. The inlet and outlet of this basin are both located in the northwest corner, this arrangement preventing the basin from acting as other than a storage for reserve supply, filtered water probably leaves the basin almost as soon as it enters.

From the clear water basin the filtered water is conducted through a 20-inch pipe line to the pump well of the high service pumping engine. This pump delivers the filtered water directly to the city through the new 20-inch force main although any excess over consumption goes into the new storage and distributing reservoir 1 mile west of the city. The new high service pump is a Snow, cross-compound, double acting, duplex pump with a capacity of 4,000,000 gallons daily. One of the old Worthington, 1,500,000 gallons, duplex pumps has been retained for use in emergencies. The pipe connections are so arranged that either pump can pump raw or filtered water through either the new 20-inch or old 12-inch force mains. The steam for operating the pumps is generated in three boilers, two of which are rated at 175 horsepower each and the third at 150 horsepower. The pumps and boilers are housed in a substantial brick building, which has been enlarged recently to contain the additions to the pumping equipment.

The new storage reservoir west of the city is approximately 100 feet square and 17 feet deep, divided into two equal compartments by a transverse wall, each compartment having a capacity of 1,000,000 gallons. The reservoir is of concrete covered with a groined arch roof. Electrical devices record at the pumping station the amount of water contained in the reservoir. Both compartments are provided with valves for draining at times of cleaning. Since the new reservoir has been in use the old reservoirs at the springs, formerly a part of the city supply, have been abandoned.

The inspection of the waterworks was made by Mr. E. S. Chase, assistant engineer in this Department, following a request received from Dr. G. S. Allen, health officer of Geneva, for analyses of the public water supply in order to show the efficiency of the new filters. On this inspection the assistant engineer was accompanied by Dr. Allen, Mr. Howard of the Board of Public Works, and Mr. J. W. Brennan, city engineer.

Seneca lake extends for nearly 40 miles south of Geneva and ranges in width from 1 to 3 miles. It is fed by numerous small streams and springs and has two outlets one at the northeastern corner opposite Geneva, through the Seneca river and the other at the northwestern corner at Geneva through the Seneca canal. With the exception of Geneva there are no municipalities of any size located on the shores of the lake and with this exception there are but two points where any quantity of sewage is discharged into the lake. These places are Watkins, with a population of about 3,000, at the extreme southern end of the lake, and the Willard Insane Hospital, with about 3,000 population, 15 miles below Geneva on the east shore.

A report of an investigation of a typhoid fever outbreak at the Willard Hospital will be found on page 613 of the Thirty-first Annual Report of this Department. The cause of the outbreak was attributed to the infection of the water supply of the hospital, derived from Seneca lake, by sewage discharged into the lake by the hospital itself. Among the recommendations made in the report of this investigation were the following:

> " (3) That all of the sewers leading from the institution buildings be intercepted by an intercepting sewer and carried to a suitable point of sewage disposal on the lake front at the northerly end of the institution grounds.
>
> " (5) That a sewage disposal plant be installed to partially or completely purify (or disinfect) the sanitary sewage before it is discharged into the lake."

Plans were approved by this Department in 1912 for a sewage disposal plant at this hospital with the provision that the effluent should be sterilized before discharge into Seneca lake.

Pollution of the lake may also take place from steam boats which ply between several ports on the lake and to a small extent from the scattered population along the lake shores. The greatest amount of pollution comes from the city of Geneva itself which discharges its sewage into the lake at its northewestern end about 3 miles from the waterworks intake. A small amount of sewage is discharged also about 1¼ miles north of the intake.

Under ordinary conditions it is probable that nearly all the sewage from Geneva is carried away from the lake through the canal, but under certain conditions of wind, particularly during northerly winds, it is entirely possible that currents are set up in the lake which carry some of the sewage from the city to the immediate vicinity of the waterworks intake. The occasional occurrence of active contamination of the water as shown by the analyses of the unpurified supply is evidence of such sewage pollution. Further evidence of this contamination is shown by the fact that the city often experiences outbreaks of diarrheal disease. Typhoid fever also has been somewhat more prevalent than can be considered satisfactory. The following tables give the cases of typhoid reported for each month during the past few years.

	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1908...	1	4	4	....	....	....	....	3	1	....	....	.....
1909....	....	....	....	....	....	....	....	5	2	1	2	4
1910....	6	3	5	0	1	0	1	4	1	1	0	5
1911....	5	5	2	0	4	1	1	11	10	7	3	2
1912....	1	0	1	1	2	0	4	1	2	4	3	0
1913....	0	0	0	0	1	0	0	0	1	1	2	0
1914....	10	0	....	....	....	....	....	....	....	....	....	.....

This table shows the irregular occurence of the disease in several small outbreaks at various times of year. This irregularity of occurrence often indicates the infection of the water supply. The most recent of these outbreaks occurred in January of the present year and was preceded by a large amount of diarrheal disease in the city. The experience of Geneva parallels that of several cities, notably Chicago and Cleveland which have used unpurified water from lakes into which they have discharged their sewage. It has been shown repeatedly that under certain conditions of winds, etc., sewage discharged into lakes may be carried by currents several miles from the point of such discharge. That Geneva has not suffered more severely is probably explained by the high dilution and by the time required for sewage from the city to reach the intake.

At the time of the inspection samples were taken of raw water at the intake well of the pumping station, of the effluent from each filter unit, of the combined effluents before entering the clear water basin, of the water from a tap at the high service pump, and from a tap in the city. The results of the chemical and bacteriological analyses of these samples, as well as analyses of the unfiltered supply in 1912 and 1913, made by the State Hygienic Laboratory, are given in an appended table.

The analyses made in the past of the water supply derived unpurified from Seneca lake show frequently the presence of active contamination as indicated by the high bacterial counts and the presence of organisms of the B. coli type in quantities of samples as small as 1 c. c. The chemical results do not afford strong indications of this contamination and as would be expected the filtration of the lake water does not change the chemical constituents of the water to any marked degree. Aside from the removal of turbidity the efficiency of a purification plant is judged by the bacteriological results. The recent analyses show that the total numbers of bacteria remaining in the effluents of both filters were satisfactory, but the presence of B. coli even in quantities as large as 10 c. c. is not desirable in a filtered water. There seems to have been an increase of bacteria in the filtered water basin but the sample taken from the tap in the city showed the absence of B. coli in all three inoculations.

As the filters were put into operation the middle of January they have had but a short time in which to mature and this in cold weather. The maturing of a slow sand filter is brought about by the formation around each sand grain of a gelatinous film of bacteria or other organisms. It is this film which attracts and retains bacteria from the water being filtered. This film does not form quickly in cold weather and especially is this true when a filter is new. It therefore seems probable that the maturing of these filters is not completed and that consequently they have not yet reached their highest efficiency.

The proper operation of any water purification process can be determined upon only through the aid of data furnished by regular and systematic bacteriological analyses. Without such analyses it is impossible to know definitely of just how much value the process is in removing harmful bacteria. In case the filters do not adequately purify the water, the bacterial results will give warning of such failure and remedial measures may be applied before confirmatory proof occurs in the shape of a typhoid outbreak.

The design and construction of the water works seem to have been executed with care and thoroughness and apparently there is every reason to expect excellent results if under proper operation. I would therefore recommend that, in order to have a guide for the maintenance of a high standard of operation, the Board of Public Works continue the periodic bacterial examination of the the raw and filtered water. In this connection the Board might consider the establishment of a small laboratory for such examinations.

ALBANY, N. Y., *April* 23, 1914

ANALYTICAL DATA OF WATER SUPPLIES

Abbreviations used to describe odors of water: 0, none; 1, very faint; 2, faint; 3, distinct; 4, decided; 5, strong; 6, very strong; a, aromatic; d, disagreeable; e, earthy; f, fishy; g, grassy; m, musty; v, vegetable

Municipality	County	Source	Date of collection	PHYSICAL				CHEMICAL (PARTS PER MILLION)											BACTERIOLOGICAL			
						ODOR		SOLIDS			NITROGEN AS —						HARDNESS			B. COLI TYPE + = PRESENT — = ABSENT		
				Color	Turbidity	Cold	Hot	Total	Loss on ignition	Mineral residue	Free ammonia	Albuminoid ammonia	Nitrites	Nitrates	Oxygen consumed	Chlorine	Total	Alkalinity	Bacteria per c.c.	10 c.c.	1 c.c.	1-10 c.c.
Geneva	Ontario	Unfiltered public supply	2/12/12	Tr.	Cl.	....	....	235	10	225	.006	.036	.001	0.40	0.80	56.0	114.2	104.0	150	—	—	—
Geneva	Ontario	Unfiltered public supply	3/20/12	5	Tr.	....	....	224	31	198	.020	.066	Tr.	0.34	1.20	......	160.0	100.0	350	+	+	—
Geneva	Ontario	Unfiltered public supply	10/9/12	Tr.	Tr.	....	....	247	60	187	.004	.062	.001	0.28	1.50	58.0	105.8	99.0	1,900	+	+	—
Geneva	Ontario	Unfiltered public supply	11/28/12	Tr.	Cl.	....	....	308	24	284	.008	.070	.001	0.34	1.20	59.0	117.2	100.0	50	+	—	—
Geneva	Ontario	Unfiltered public supply	12/30/12	Tr.	Tr.	....	....	340	36	304	.006	.064	Tr.	0.34	1.30	59.0	105.8	102.0	70	—	—	—
Geneva	Ontario	Unfiltered public supply	2/7/13	Tr.	2	1 v.	1 v.	229	....	....	.008	.076	Tr.	0.36	1.60	59.0	122.8	101.0	100	—	—	—
Geneva	Ontario	Unfiltered public supply	3/21/13	Tr.	Tr.	1 v.	1 v.	215	....	....	.018	.070	Tr.	0.26	1.50	58.0	102.8	98.0	3,600	—	—	—
Geneva	Ontario	Unfiltered public supply	5/15/13	Tr.	Cl.	1 v.	1 v.	230	....	....	.012	.060	.001	0.24	0.90	58.0	105.8	96.0	....	—	—	—
Geneva	Ontario	Unfiltered public supply	6/20/13	Tr.	Cl.	2 a	2 a	244	....	....	.004	.048	.001	0.22	0.80	60.0	97.2	97.0	8,700	2+1—	0+3—	0+3—
Geneva	Ontario	Unfiltered public supply	7/24/13	Tr.	Cl.	1 v.	1 v.	266	....	....	.004	.058	.001	0.22	0.70	57.0	120.0	105.0	20	2+1—	0+3—	0+3—
		Filters put into service January, 1914:																				
Geneva	Ontario	Raw water, Lake Seneca	4/1/14	Tr.	5	....	....	248	37	211	.014	.084	.001	0.36	2.20	60.0	102.8	98.0	1,000	3+0—	1+2—	0+3—
Geneva	Ontario	Effluent filter No. 1	4/1/14	....	....	....	....	....	....	....	....	....	....	....	....	......	......	......	60	2+1—	0+3—	0+3—
Geneva	Ontario	Effluent filter No. 2	4/1/14	....	....	....	....	....	....	....	....	....	....	....	....	......	......	......	15	1+2—	0+3—	0+3—
Geneva	Ontario	Combined effluents	4/1/14	....	....	....	....	....	....	....	....	....	....	....	....	......	......	......	25	3+0—	0+3—	0+3—
Geneva	Ontario	Tap at force main	4/1/14	Tr	Cl.	....	....	230	33	197	.014	.062	.001	0.34	1.40	60.0	102.8	95.0	120	2+1—	0+3—	0+3—
Geneva	Ontario	Tap in city	4/1/14	Tr.	Cl.	....	....	243	32	211	.018	.062	.001	0.34	1.60	60.0	100.0	96.0	140	0+3—	0+3—	0+3—

Copies of the above report were transmitted to the Board of Public Works of Geneva and to Dr. G. S. Allen, health officer.

HADLEY and LUZERNE

An inspection of the public water supply furnished by the Garner Water Company to the villages of Hadley and Luzerne was made on September 22, 1914.

Hadley and Luzerne are unincorporated villages of 250 and 800 inhabitants respectively, located about 60 miles north of Albany on the North Creek Branch of the Delaware and Hudson R. R. Hadley is on the west bank of the Hudson river and Luzerne is on the east bank. There are no industries in either village although during the season there may be 700 or more summer boarders in the two villages. Neither village has sewers and the population is served by privies and cesspools.

The public water supply is derived from Seymour brook at a point about two miles east of the village of Luzerne. This brook flows into the Hudson about three miles below the villages. The water works are owned and operated by the Garner Water Company of which Mr. W. T. Garner is president and Mr. E. M. Garner, superintendent. The water works were constructed in 1893 and a new concrete dam across the brook was built in 1911. Practically the entire population of both villages is supplied by the water works and although there are no meters and no data of any sort, regarding the daily consumption, it may be roughly estimated at 100,000 gallons. The water is distributed by gravity through about 5 miles of cast-iron water mains ranging in size from three to ten inches in diameter. The average pressure in the villages is about 130 pounds per square inch. There are no hydrants for fire protection and no water is used for industrial purposes.

The water supply has been developed by the construction of a dam across Seymour brook at a point where a small ravine affords a natural storage basin and where the elevation is sufficiently high to allow gravity distribution. The impounding reservoir thus formed is about 100 ft. wide, 120 ft. long, 10 or 12 feet deep in its deepest part and with a capacity, roughly estimated, of 500,000 gallons. The dam is of concrete of the gravity type, about 100 ft. long with 15 ft. wing walls at each end, and about 15 ft. high. The reservoir is provided with a 10-inch drain pipe and valve for emptying the reservoir at times of cleaning.

The intake is located about 20 ft. from the dam, 10 ft. from shore and in about 7 or 8 ft. of water. This intake consists of a concrete well about 8 ft. square and 12 ft. in depth. The bottom of the well is about 3 ft. below the bed of the reservoir and about 11 ft. below the water level. Water enters the chamber through rectangular openings in each of the four side walls, these openings being about 6 ft. long and 2½ ft. deep covered with wire screens of about ¼-inch mesh. The lower edges of the openings are about 2 ft. above the bed of the reservoir. The water main leading from the intake well is 10 inches in diameter and is provided with a conical, galvanized iron strainer, containing perforations about ⅛ inch in diameter. The top of the well is covered by a wooden roof.

The inspection of this water supply was made by Mr. E. S. Chase, assistant engineer in this Department following the receipt of a complaint from Mr. J. D. Mulrenan, member of the Board of Health of the town of Hadley, in respect to the unsatisfactory quality of the supply. The assistant engineer was accompanied and aided on his inspection by Dr. G. R. Thompson and Dr. S. S. Kathan, health officers of the towns of Luzerne and Hadley respectively. Information was also obtained from Mr. J. D. Mulrenan, Mr. W. T. Garner and Mr. E. M. Garner.

The drainage area tributary to this water supply is approximately 0.90 sq. miles. This area consists of the side slopes of two small mountains. Seymour brook from which the supply is obtained flows through the valley thus formed. This stream rises in a swamp among the hills about 1 mile north of the reservoir and flows in a southerly direction until it joins the Hudson. The topography is typical of the Adirondack foot hills and the soil is sand and gravel interspersed with granite boulders. The watershed area is completely covered with second-growth hard wood timber with scattering groups of pine. No pasturing or agriculture occurs on this area and the only contamination that could probably take place would be that from the wild animals, occasional hunters, fishermen, picnic parties or lumbermen. It is said that picnic parties sometimes visit the vicinity of the reservoir and some danger of contamination exists due to this practice. The water company owns about 100 acres of watershed above the reservoir.

The cause of the complaint seems to have been the occurrence at times of considerable turbidity. As far as could be determined this was due to the accumulation of sediment at various dead ends of the distribution system. The nature of this sediment could not be determined as the trouble had been overcome previous to the time of the inspection. From the description of this sediment given by people residing near dead ends it seems probable that it was a mixture of iron rust, mud and possibly some decomposing organic matter. The greatest amount of trouble seems to have been experienced at Hadley at the far end of the distribution system. Previous to the present year, it was stated, it has been the custom of the water company to keep the blow-off valves at the dead ends partly open in order to allow a small stream of water to flow constantly. This probably was sufficient to prevent stagnation and kept the water cool and in a palatable condition. During the past summer these valves were kept shut for three or four months and it therefore seems probable that the lack of frequent flushing of the water mains tended to cause the accumulation of sediment. It is stated that there are a few dips or inverted siphons at certain points in the distribution system and that flushing of the mains often brings about the stirring up of sediment deposited at those points. Sufficient flushing, however, should prevent such deposition although if such should prove not to be the case, blow-off pipes and valves should be installed at such inverted siphons.

The reservoir is usually cleaned every year in June but this year this cleaning did not take place. It is therefore possible that the decomposition of accumulated organic matter of vegetable origin in the reservoir produced free carbon dioxide and consequently increased the corrosion of the iron water pipe bringing about an increase in iron rust which accumlated as sediment in dead ends.

It is also stated that a certain amount of algae growth occurred in the reservoir during the summer and at the time of the inspection there seemed to be such a growth upon the rocks at the bottom and sides of the reservoir. No trouble in respect to tastes and odors which might have been caused by algae, seems to have occurred and while such growths may have been unsightly they do not seem to have directly affected the character of the water.

At the time of the inspection a sample of water was taken the analysis of which made by the Division of Laboratories and Research may be found in the accompanying table.

This analysis indicates a water which at the time the sample was taken was clear and practically colorless, relatively hard and of satisfactory physical quality for a public supply of potable water. The figure for free ammonia is rather high showing the presence of a certain amount of decomposing nitrogenous matter. This is probably due to the decaying of organic matter of vegetable origin and this explanation is borne out by the somewhat high result obtained in the oxygen consumed determination. Nitrogen in the form of nitrates and nitrites is present in very small amounts, indicating the practical absence of any amount of past pollution. The chlorine figure is slightly higher than is normal in this region but so little higher as to be without special significance. The bacterial results are less satisfactory than the chemical results. The total bacterial count although not excessively high is somewhat greater than can be considered desirable in a potable supply and the presence of organisms of the B. coli type in an inoculation as small as 1 c. c. shows the presence of a certain amount of pollution of animal origin. From the consideration of the sources from which this supply is obtained it does not seem that this pollution is of human origin although it is possible that an accidental contamination may have reached the reservoir from some chance visitor being in its vicinity.

In view of the above facts, the following conclusions may be drawn:

1. That the water supply furnished by the Garner Water Company is derived from a watershed practically free from permanent sources of contamination and except for contamination referred to below this supply should be of a general satisfactory esthetic and sanitary quality.
2. That, so far as can be ascertained the sources of contamination to which the supply is occasionally subject are those incidental to hunters, fishermen or lumbermen and possibly birds and the lower animals.
3. That, the recent unsatisfactory quality of the water was probably due to accumulation of sediment caused by insufficient flushing of the dead ends of the distribution system, but this affected the aesthetic rather than the sanitary quality of the water.
4. That in case the accumulation in the reservoir of organic matter of vegetable origin is not removed by the yearly cleanings, there is possibility of algae growths with accompanying obnoxious tastes and odors.

Based on these conclusions I would make the following recommendations:

1. That in order to protect as far as possible the waters of the reservoir from contamination from chance sources, the Garner Water Company fence off their property around the reservoir and forbid any trespassing thereon.
2. That, the water mains be flushed thoroughly every month during the summer or oftener if found necessary in order to prevent the deposition of sediment in the mains and in this connection it might be well to consider making cross connections between dead ends thereby insuring better circulation.
3. That the Water Company continue to clean the reservoir every year as has been their custom in the past.

ALBANY, N. Y., *October* 14, 1914

REPORT OF WATER ANALYSIS FOR HADLEY AND LUZERNE

Laboratory No.	....
Source	Tap in D. & H. R. R. Station, public supply
Collected on	9/22/14, 4:15 P. M.
Color	Trace
Turbidity	Clear
Odor, cold	1 a
Odor, hot	1 a
Solids, total	71
Loss on ignition	9
Mineral residue	62
Ammonia, free	.042
Ammonia, albuminoid	.010
Nitrites	.001
Nitrates	0.02
Oxygen consumed	2.00
Chlorine	0.50
Hardness, total	41.6
Alkalinity	41.0
Bacteria per c.c.	210
B. coli type	10 c.c. 2 + 1 — 1 c.c. 1 + 2 — 1/10 c.c. 0 + 3 —

Results are expressed in parts per million. + Present. — Absent.

Abbreviations used to describe odors of water: 0, none 1, very faint; 2, faint; 3, distinct; 4, decided; 5, strong; 6, very strong; a, aromatic; d, disagreeable; e, earthy; f, fishy; g, grassy; m, musty; v, vegetable.

Copies of the above report were transmitted to the Garner Water Company, to Dr. G. R. Thompson, health officer of Luzerne, and to Dr. S. S. Kathan, health officer of Hadley.

HIGHLAND FALLS

An investigation of the public water supply of the village of Highland Falls was made on April 13, 1914.

Highland Falls is an incorporated village of about 2400 inhabitants located in Orange county on the west bank of the Hudson river, about 50 miles north of New York City and two miles south of the U. S. Military Post at West Point. The village has no manufactures, as a great many of the inhabitants are civilian employes at West Point. Several large estates of wealthy men are situated in this vicinity. The village is located on high ground about 200 feet above the Hudson river. There is no public system of sewers and consequently the village is served by cesspools and outside privies. It is stated that on account of the lack of sewers there exist numerous nuisances from overflowing cesspools which are almost impossible to abate.

The public water suply is derived from Buttermilk Falls stream, a small mountain stream rising in the hills west of the village, the intake of the waterworks being about ½ mile west of the village center. The waterworks are owned and operated by the Citizens Water Co. of Highland Falls, of which Mr. L. F. Goodsell is president. The waterworks were constructed in 1890 and in 1906 a new reservoir was built and other improvements made. It is estimated that not over 700 people are supplied with the public water supply or about 33% of the population. Notwithstanding the small numbers of consumers, the daily water consumption is about 300,000 gallons. This may be due to the fact that none of the service taps, of which there are about 200, are metered. The water is supplied by gravity through about 4 miles of cast iron pipe ranging in size from 4 to 8 inches, and the pressure in the village is 90 lbs. per square inch. The West Shore Railroad is supplied with the village water for locomotive feed and some of the large country estates are also supplied.

The waterworks consist of two storage reservoirs located in the hills about 4 miles west of the village at the head of the Buttermilk Falls stream. From these reservoirs the water flows in the stream for about 3 miles to the intake or distributing reservoir. Before reaching the intake the stream is augmented by several smaller tributaries, the chief of which is the Stony Lonesome Brook, which joins the main stream about ½ mile above the intake. From the intake the water is carried to the village by an 8-inch cast-iron main.

The intake reservoir is formed by a masonry wall thrown across the stream between the steep rocky banks of a narrow ravine. This dam forms a small reservoir about 100 ft. long and 80 ft. wide; covering an area of about ¼ acre. This reservoir is divided into two parts by a longitudinal division wall of masonry, one part serves as a receiving chamber, while from the other the main leads to the distribution system. Both compartments have a layer of sand, two to three feet in depth over the bottom, through which the water filters before reaching the intake pipe.

The two storage reservoirs are about 1100 ft. above sea level in a hollow among the hills. The older of the two known as the Bog Meadow pond, covers an area of 45 acres to an average depth of about 10 feet and has an estimated capacity of 200,000,000 gallons. This reservoir is formed by a low dam of rip-rap masonry and earth. The newer reservoir which is down stream a few hundred feet from Bog Meadow pond covers an area of 12 acres to a depth of about 25 ft. and has an approximate capacity of 90,000,000 gallons. This reservoir is formed by a dam of stone masonry. The reservoir sites were thoroughly cleaned a few years ago. It is planned to clean the Bog Meadow pond reservoir every three years and the new reservoir every year. The intake reservoir is flushed very spring and the sand cleaned by scraping every month or oftener in the summer.

The watershed above the intake is approximately 5 square miles in area, of irregular shape, about 3 miles long and 3 miles wide in its widest part. The greater part of this area consists of high wooded hills, with steep slopes and irregular rock outcrops. A small portion of the area, in hollows between the hills, consists of low and swampy land. Very little of the land is devoted to agriculture as the soil is very thin and gravelly. A part of the U. S. Military Reservation extends over this watershed.

The investigation of this water supply was made by Mr. E. S. Chase, assistant engineer in this Department, in accordance with the policy of the Department of making special investigations of the water supplies of the State. The assistant engineer was accompanied and aided by Dr. H. T. Kurtz, health officer of the village of Highland Falls.

There are in all, about 36 dwellings with accompanying barns and outbuildings located on this watershed, with an estimated population of 180 or 36 per square mile. On account of the abrupt slopes rising from the stream most of the houses are located in the narrow valley close to the stream. A few hundred feet above the intake reservoir there is a group of five houses on the southern bank of the stream none of which are more than 500 feet from the brook. Another group of 12 houses is located at the junction of Stony Lonesome brook with the main brook. These houses also are not over 500 ft. from the stream, some being very close, and the slopes are steep. At this point there are two or three privies within 50 ft. of the brook. The drainage from barnyards, etc., from around these dwellings must reach the brook very quickly especially at times of rainfall. Above this group of houses and scattered along the main brook, are 12 or 13 houses and one schoolhouse. With the exception of 3 or 4 houses they are situated within two or three hundred feet of the stream. The privy at the schoolhouse is located on a steep bank above the brook. There are 6 houses scattered along Stony Lonesome brook. The privies at two of these houses are within 50 ft. of the brook. At one house a case of typhoid occurred 4 years ago. At the head of this branch brook is a farm upon which hogs are raised. These hogs are fed upon garbage collected from West Point and the enclosures in which they are allowed to run are one to two hundred feet back from the brook. The brook receives barnyard drainage and cattle have access to it at numerous points.

The land surrounding the storage reservoirs is uninhabited and the water company owns about 90 acres of land around these reservoirs. At the intake reservoir the water company owns a strip of land up the brook for a few hundred feet. At one time, diversion of water from Bog Meadow pond was made into the West Point water supply, but this diversion has not been practiced for two or three years.

At the time of this inspection a sample of the public supply was collected for chemical and bacteriological analyses. The results of these analyses together with those made in the past by the State Hygienic Laboratory will be found in the appended table.

These analyses show a water rather high in color and often high in turbidity but with low mineral content and very soft. The figures for free and albuminoid ammonia are variable and at times are high, indicating variation in the amounts of nitrogenous organic matter reaching the stream. Variation also takes place in the nitrite and nitrate figures, oxygen consumed, and chlorine. It seems probable that these variations are due to changes in run-off and to changes in the amount of polluting material reaching the stream. From a consideration of the information brought out by the inspection of the watershed it is apparent that the high figures for nitrogen in its various forms are due to the presence of polluting matter from barnyards, farm lands and from leaching privies. The bacterial content is variable and usually higher than can be considered desirable in a potable water supply. The presence of active contamination is noted in all the samples by the occurrence of B. coli and at times these organisms are present in quantities as small as 1/10 c. c.

Since 1908 there have been comparatively few cases of typhoid in Highland Falls but in August of that year a severe outbreak occurred. The outbreak was investigated by this Department and a report of this investigation will be found in the Twenty-ninth Annual Report, vol. I, p. 540. It was the conclusion of this report that the outbreak was due to infected milk although the danger of contamination of the public water supply was also pointed out. The following table gives the occurrence of typhoid in Highland Falls during the past few years.

Years	1908	1909	1910	1911	1912	1913
Cases.	56	6	1	8	2	2

It is thus evident that one or more cases of typhoid have occurred in the village every year during the past six years.

In consideration of the above facts, the following conclusions may be drawn:

1. That the so-called filter at the intake reservoir acts only as an inefficient strainer and is of little protection to the quality of the water.
2. That the water supply is actively contaminated at nearly all times with drainage from farm lands, barnyards and privies.
3. That this contamination occurs to the brooks flowing through the populated valley, rather than to the water in the reservoirs in the hills and that the water from these reservoirs is probably unpolluted and free from contamination.
4. That the occurrence of typhoid fever in any of the houses on the watershed would be a serious menace to the water supply.

In view of these conclusions I beg to submit the following recommendations:

1. That the water company consider at once the improvement of the supply, either by extending a line of intake pipe to the reservoirs in the hills or by installing a modern and efficient method of water purification.
2. That, pending such improvement to the water system, the company take steps to remove the dangerous sources of pollution such as privies, to much greater distances from the brooks.
3. That, in case the water company experiences any difficulty in removing such sources of pollution, they apply to this Department for the enactment of Rules and Regulations for the protection of their supply from contamination as provided by section 70 of the Public Health Law.

ALBANY, N. Y., *April* 28, 1914

ANALYTICAL DATA OF WATER SUPPLIES

Abbreviations used to describe odors of water: 0, none; 1, very faint; 2, faint; 3, distinct; 4, decided; 5, strong; 6, very strong; a, aromatic; d, disagreeable; e, earthy; f, fishy; g, grassy; m, musty; v, vegetable

				PHYSICAL				CHEMICAL (PARTS PER MILLION)											BACTERIOLOGICAL			
						ODOR		SOLIDS			NITROGEN AS —						HARDNESS			B. COLI TYPE + = PRESENT — = ABSENT		
Municipality	County	Source	Date of collection	Color	Turbidity	Cold	Hot	Total	Loss on ignition	Mineral residue	Free ammonia	Albuminoid ammonia	Nitrites	Nitrates	Oxygen consumed	Chlorine	Total	Alkalinity	Bacteria per c.c.	10 c.c.	1 c.c.	1-10 c.c.
Highland Falls	Orange	Tap, public supply	6 23 09	18	2			34			.026	.052	Tr.	0.10	2.60	0.87	14.8	11.0	14,500	+	+	+
Highland Falls	Orange	Tap, public supply	4 14 09	23	15			40	16	30	.010	.124	.001	0.10	4.30	3.62	6.3	4.0	16,300	+	+	+
Highland Falls	Orange	Bog Meadow Pond	[illegible] 12 09	10	1			25	14	11	.004	.144	.001	0.06	3.40	1.75	4.8	3.0	7,900	+	+	—
Highland Falls	Orange	Stream at junction of brook	[illegible] 12 09	[illegible]	1			32	9	23	.010	.060	.001	0.06	2.05	1.75	11.1	8.5	100,000	+	+	+
Highland Falls	Orange	Reservoir	[illegible] 12 09	[illegible]	1			33	11	22	.052	.114	.001	0.06	2.20	1.75	11.8	9.0	60,000	+	—	—
Highland Falls	Orange	Tap, public supply	[illegible] 12 09	8	1			33	12	21	.008	.072	.001	0.08	2.00	1.75	11.8	9.0	35,500	+	+	+
Highland Falls	Orange	Tap, public supply	2 9 10	10	1			65	14	51	.008	.022	.002	0.20	2.00	2.50	14.3	8.0	375	+	—	—
Highland Falls	Orange	Tap, public supply	[illegible] 11 10	3	Tr			37	12	25	.004	.032	.001	0.20	2.00	2.00	12.7	12.0	3,100	+	—	—
Highland Falls	Orange	Tap, public supply	1 6 11	[illegible]	3			53	23	30	.010	.116	.003	0.24	4.65	3.25	19.5	8.0	2,500	+	+	—
Highland Falls	Orange	Tap, public supply	3 24 11	30	2			40	20	20	.028	.080	.001	0.04	3.40	3.25	12.7	10.0	400	+	+	—
Highland Falls	Orange	Fountain supply	3 10 11	13	Tr			50	12	38	.026	.008	.002	0.10	3.40	2.50	12.5	15.0	300	+	+	—
Highland Falls	Orange	Fountain supply	6 20 11	13	Tr			52	17	35	.006	.068	.001	0.02	2.80	3.00	23.4	12.0	3,900	+	+	—
Highland Falls	Orange	Fountain supply	10 30 11	13	2			60	10	41	.012	.084	Tr	0.04	2.80	2.75	31.2	5.0	2,000	+	+	—
Highland Falls	Orange	Fountain supply	12 18 11	13	Tr			53	14	39	.010	.062	.001	0.10	2.00	2.37	18.2	11.0	130	+	—	—
Highland Falls	Orange	Tap, fountain supply	1 23 12	[illegible]	3			51	12	39	.032	.070	Tr	0.26	1.40	2.50	18.2	11.0	200	+	—	—
Highland Falls	Orange	Tap, fountain supply	[illegible] 27 12	13	18			45	15	30	.060	.148	.001	0.16	0.40	2.00	6.3	3.0	12,000	+	+	+
Highland Falls	Orange	Tap, fountain supply	4 [illegible] 12	13	Tr			25	9	16	.008	.040	Tr	0.02	2.00	1.50	15.6	6.0	1,000	+	—	—
Highland Falls	Orange	Tap, fountain supply	10 [illegible] 12	13	Tr			45	20	23	.006	.072	.001	0.10	2.40	2.25	20.8	10.0	700	+	+	—
Highland Falls	Orange	Tap, fountain supply	11 [illegible] 12	20	[illegible]			47	18	29	.010	.136	.001	0.10	4.90	2.50	19.5	9.0	5,800	+	—	—
Highland Falls	Orange	Tap, fountain supply	12 [illegible] 12	13	[illegible]			38	13	25	.024	.046	Tr	0.20	2.80	3.50	18.2	9.0	100	+	—	—
Highland Falls	Orange	Tap, fountain supply	1 [illegible] 13	13	Tr	1v	1v	[illegible]			.008	.052	.001	0.16	2.10	2.50	16.9	5.0	170	2+1—	0+3—	0+3—
Highland Falls	Orange	Fountain supply	5 10 13	3	Tr	1v	1v	47			.008	.048	.001	0.14	1.90	2.25	11.10	7.0	800	3+0—	0+3—	0+1—
Highland Falls	Orange	Fountain supply	5 26 13	8	[illegible]	2v	2v	44			.030	.042	.001	0.06	4.60	1.75	14.3	6.0	2,300	3+0—	3+0	0+3—
Highland Falls	Orange	Fountain supply	4 18 14	12	[illegible]	1v	1v	51	11	20	.010	.060	.002	0.14	2.40	1.50	11.1	3.0	170	1+2—	0+3	0+3—

Copies of the above report were transmitted to the Citizens Water Company of Highland Falls and to Dr. H. T. Kurtz, health officer.

HILLVIEW (town of East Greenbush)

An investigation of the public water supply of the hamlet of Hillview, in the town of East Greenbush, county of Rensselaer, was made on October 22, 1914.

Hillview is a small realty development about three miles southeast of the city of Albany, reached by the Albany Southern Electric R. R. There are no sewers and the hamlet is served by outside closets and a few cesspools. The public water supply is obtained from a small reservoir or basin formed by a low dam across a brook which flows through the northern part of the hamlet. From this basin the water is pumped into an elevated tank and thence distributed to the hamlet by gravity. There are 16 houses in the hamlet, all of which are served by this supply. The population is estimated at eighty and the average daily consumption at about 2,000 gallons. There is one-half mile of water main two and one-half inches in diameter. The average pressure is 35 pounds per square inch, and only one fire hydrant is connected with the system. This water supply is leased and operated by the Hillview Improvement Association, of which Mr. J. D. Freeman is president.

The reservoir formed in the brook is merely a small shallow basin about 10 feet wide, 20 feet long and 2 or 3 feet deep with a roughly estimated capacity of 3,000 gallons. The intake from this reservoir is a 2-inch pipe protected by a perforated strainer. This pipe leads into a brick intake well which is divided by a baffle wall into two parts and whose dimensions are approximately 5 feet wide, 12 feet long and 6 feet deep, with an approximate capacity of 2,700 gallons. From this tank the water may be pumped either by windmill or by a gasoline engine to the distribution tank. The windmill is used as much of the time as possible and the gasoline engine only when there is no wind. The distribution tank is of wood supported by a steel tower and has a capacity of 12,000 gallons. The tanks are cleaned twice a year and the basin in the brook somewhat more frequently.

The inspection was made by Mr. E. S. Chase, assistant engineer in this Department, following a request for such an inspection from the Hillview Improvement Association. The assistant engineer was accompanied and aided on the inspection by Mr. E. E. Sheldon of the Association.

The water supply brook has its source in two flowing springs located about one mile east of the intake. The brook also receives the surface runoff from a drainage area of about 0.55 square miles. About one-half of this drainage area is a fairly level plain, while the other half consists of the side slopes of the low hills. Practically none of this area is wooded, but nearly all is devoted to agriculture and grazing.

There are about five dwellings, one school house and a cemetery located on the watershed. All of these are well distant from both the brook and the springs, with the exception of two dwellings located very close to the stream, less than 300 feet above the water supply intake. These two can hardly be called houses, for they are merely temporary shacks although inhabited at times. These shacks are located on a plot of ground bordering the stream and upon which, it is expected, more houses will be built in the future. Surface wash from the vicinity of the present buildings on this plot, as well as from others that might be built in the future, would reach the stream in a very short time and thereby cause a particularly serious contamination of the water supply. At one of the shacks the privy is located about thirty feet from the edge of the brook, while at the other shack there are no sanitary conveniences of any kind, thus giving every opportunity for pollution of the ground near the stream. It is said that at one of these places two horses had died and been buried close to the brook. The nearness of these places to the stream a few hundred feet above the intake, the insanitary conditions around them and the unusual opportunity for accidental or lful contamination constitute at all times a serious menace to the sanitary iality of this supply.

Opportunities also exist for contamination from both animal and human urces. About twenty head of cattle were noticed in the fields adjacent to ie brook and as the brook is not fenced off the cattle have access to the ream for drinking. Contamination may also be brought about by surface ash from the cultivated fields or by laborers working in these fields. A nall pond from which the outlet at times flows into the brook is used in immer by boys for bathing. On the date of the inspection no water was owing from the pond.

The locations of the springs are such that they are subject to wash from ltivated fields and are easily accessible to chance, animal or human visitors. y proper development and protection it seems probable that the water rived from them should be of a safe and sanitary quality.

At the time of the inspection samples of water were collected from the two rings and from a tap in the hamlet. The results of the analyses of these mples made by the Division of Laboratories and Research are given in the pended table. The sample taken at the tap in the hamlet probably does t represent normal conditions for the reason that at the time of inspecon of the watershed a muskrat was stirring up a large amount of fine clay the brook above the intake.

While a single analysis cannot serve to base definite conclusions as to the aracter of the water supply, this analysis tends to confirm the opinions rmed on the inspection. The disturbing effect caused by the muskrat is idenced chiefly by the turbidity since above the point of its activities the rook water was clear. The analysis indicates a very hard water and one ith a comparatively small amount of decomposing organic matter. The lorine content is about six times greater than that normal in this region, hich is probably due largely to presence of past pollution from animal urces. The bacterial count is very high and the presence of organisms the B. coli type in all three inoculations indicates considerable contaminaon by animal wastes. While the surroundings of the two springs at the urce of the stream would indicate absence of contamination from human urces, contamination from animal sources might be expected and this is robably the cause for the high bacterial counts in these springs and the resence of B. coli in samples as small as 1 c.c.

In view of the above facts the following conclusions may be drawn:

1. That the water supply of Hillview is open to serious and dangerous contamination from the insanitary surroundings and the unclean habits of the occupants of the two shacks located above the intake.
2. That the water supply is further subject to the contamination from run-off from cultivated fields and pasture lands and from animals having access to the stream.
3. That accidental, chance or willful contamination may be caused by people walking over the watershed or along the brook.
4. That the two springs at the source of the brook, if properly protected from contamination, would probably afford a satisfactory supply for the present population.

In view of the above conclusions the following recommendations may be ade:

1. That the Hillview Improvement Association take steps immediately either to improve their present supply or seek a new supply from a source above suspicion.
2. That in case the present supply is retained it would probably be advisable to pipe the two springs directly to the water works system, thus avoiding in a large measure contamination from surface sources to which the present supply is subjected.
3. That in case these springs are developed, every precaution be taken to protect them from surface wash and contamination from chance sources by fencing off the land upon which they are located, constructing concrete collection wells, and drainage ditches for diversion of surface wash.

LBANY, N. Y., *November* 12, 1914

REPORT OF WATER ANALYSES FOR HILLVIEW

Laboratory No.				
Source		Tap in village	South spring at source	North spring at source
Collected on		10/22/14	10/22/14	....
Color		3	....	....
Turbidity		10	....	....
Odor, cold		2 v.	....	....
Odor, hot		2 v.	....	....
Solids, total		298	....	....
Loss on ignition		22	....	....
Mineral residue		278	....	....
Ammonia, free		.002	....	....
Ammonia, albuminoid		.024	....	....
Nitrites		.001	....	....
Nitrates		0.10	....	....
Oxygen consumed		2.20	....	....
Chlorine		3.25	....	....
Hardness, total		250.0	....	....
Alkalinity		198.0	....	....
Bacteria per c.c		650	150	160
B. coli type	10 c.c.	3+0—	3+0—	3+0—
	1 c.c.	3+0—	2+1—	3+0—
	1/10 c.c.	3+0—	0+3—	0+3—

Results are expressed in parts per million. + Present. — Absent.

Abbreviations used to describe odors of water: 0, none; 1, very faint; 2, faint; 3, distinct; 4, decided; 5, strong; 6, very strong; a, aromatic; d, disagreeable; e, earthy; f, fishy; g, grassy; m, musty; v, vegetable.

Copies of the above report were transmitted to the Hillview Improvement Association and to Dr. I. M. Garrison, health officer of the town of East Greenbush.

HOBART

An inspection of the public water supply of Hobart, N. Y., was made on April 28, 1914.

Hobart is an incorporated village of about 600 inhabitants located in the northeastern part of Delaware county on the Ulster & Delaware railroad 30 miles southeast of the city of Oneonta. The village has recently installed a sewerage system and disposal plant which have just been put in operation. The water works are owned and operated by the Hobart Water Company of which Mr. J. Lawrence is president and Mr. A. J. Lawrence, superintendent. The original water works were installed in 1887 but have been improved by the construction of a new filtration plant, intake and raw water basin. These improvements were designed by Morrell Vrooman, consulting engineer, and constructed by contract by T. R. Crane of Schenectady, under the direction of Mr. Vrooman. The improvements were completed and put into service in 1913.

The water supply is derived from Town brook, the intake being about 4 miles southeast of the village. From this intake the water is conducted to the filter plant which is located on the bank of Grant brook about 1 mile east of the village. The entire population of the village is supplied with the filtered water and large amounts of unfiltered water are used by the railroad and the Sheffield Farms Creamery which are connected by a separate pipe line directly from the raw water basin. While there are no accurate figures available, the total daily consumption of both filtered and unfiltered water may be estimated at approximately 200,000 gallons. There are in all 6¼ miles of cast-iron mains ranging in size from 4 to 8 inches in diameter. The water is distributed by gravity under a pressure of 70 pounds per square inch through 110 service taps none of which are metered. Originally Grant brook was the source of supply but for the last few years it has not been used except in times of emergency.

The new intake is a small concrete dam about 35 feet long and 4 feet high across Town brook. The water from behind this dam flows into a small concrete well provided with a screen and thence into the main 3 miles long leading to the raw water basin at the filter plant. This basin is about ¼ of an acre in area and 7 or 8 feet deep with an estimated capacity of about 600,000 gallons. From the basin the water flows directly upon the filter. The filter is 40 feet square, surrounded by a concrete wall and covered with a concrete roof. The depth of sand in the filter is 5 feet. This sand has a uniformity coefficient of 3 and an effective size of 0.27 mm. The underdrains consist of 5 lines of 6-inch tile spaced 8 feet center to center and laid with open joints. Over these pipes is placed a layer of washed gravel about 1 foot in thickness. The depth of water carried over the sand is about 4 feet, this head being fixed by the elevation of the water in the raw water basin. The regulation of the rate of filtration was made by Mr. Vrooman when the filter was first started and was accomplished by setting the valves leading from the underdrains into the clear water basin. The local superintendent does not attempt to vary this rate of filtration. The filter is cleaned about every 60 days when weather conditions permit. The criterion used to indicate the time when cleaning is necessary is when the loss of head becomes so great as to prevent sufficient water being filtered to supply the village. When cleaned the sand is removed to a depth of about 1 inch, by laborers using flat shovels. About 1 foot of sand is removed before it is replaced by new sand. No attempt is made to clean the dirty sand taken from the filter. For cleaning, 8 men are required for about 2 hours, the cleaning being done at night, when the filter can be shut off without interfering with the water consumption of the village.

The clear water basin is a continuation of the concrete structure which contains the filter, being separated from the filter by a transverse concrete wall. This basin is 30 feet by 40 feet, 9 feet deep, and has a capacity of approximately 80,000 gallons. Between the basin and the filter is a small concrete gate house, in which are 2 valves for the control of the rate of filtration. From the basin the filtered water is supplied directly to the village. The total cost of this new work, including the intake, raw water basins, filter and clear water basins, approximated $18,000. The principal cost of operating the plant is that of cleaning the filter, which amounts to about $8 each time.

In January and February, 1910, an outbreak of typhoid fever occurred in Hobart, which was investigated and reported upon by this Department, the report of which may be found on page 593 of the Thirty-first Annual Report of this Department. The results of this investigation seem to show that the cause of the outbreak was the infection of that part of the water supply derived from Town brook, and it was recommended that this supply be abandoned, which was done. Another outbreak of typhoid fever occurred in June and July, 1911, the report on the investigation of which may be found on page 805 of the Thirty-second Annual Report of this Department. This outbreak was apparently due to the infection of a semipublic spring located in the village. This report made strong recommendations for the improvement of the village water supply, the installation of a sewerage system and the abandonment of wells and springs located in the village. These outbreaks were probably the determining factors in the improvements to the water supply and sewerage conditions in the village.

The inspection was made by Mr. E. S. Chase, assistant engineer in this Department, following a request from the Hobart Water Company for the enactment of rules and regulations for the protection from contamination of their supply. The assistant engineer was accompanied on this inspection by Mr. A. J. Lawrence, superintendent of the water company. This inspection covered the watershed of Grant brook and also a large portion of the watershed of Town brook. While the Grant brook supply is not used at present save in times of emergency, it is the desire of the water company to use this supply if possible to do so without danger.

About ⅛ of a mile above the filter on Grant brook is a small impounding reservoir, with a capacity of about 3,000,000 gallons. This reservoir formed part of the old supply and, in case the Grant brook were again used, would be repaired and put into service. At present this brook is by-passed around the raw water basin, although gates are provided whereby this water could be admitted to the raw water basin in times of emergency.

The Grant brook watershed is 0.7 of a square mile in area, being about 2 miles long and ¾ of a mile wide, the slopes of which are fairly steep. This watershed is practically cleared land and devoted mainly to grazing and agriculture. There are but 4 houses upon this watershed, and 2 of these are well back from the stream. The total resident population is about 20 or 29 per square mile. In summer, however, this number is increased appreciably by summer boarders, who go to two of the houses on the watershed.

The first house on the Grant brook watershed above the filter is ⅛ of a mile up stream, about opposite the old reservoir. The house and outbuildings are 300 to 500 feet distant from the brook and there seems to be little opportunity for direct contamination. The same may be said of the second house, about ¼ mile up-stream, where the buildings are located 500 to 600 feet from the brook. At the third house, 1¼ miles up-stream, the privy is about 150 feet from the stream. The brook also flows through one corner of the barnyard and consequently must receive considerable pollution from animal sources at this point. This house may have at times as many as 20 summer boarders. The outside closet is provided with removable container and, according to the owner, it is cleaned every day in summer and the contents disposed of by burying in the fields away from the brook. The fourth and last house is 1½ miles above the filter and near the head of the brook. This house, which is about 300 feet from the brook, has inside closets and plumbing, and is served by a cesspool located about 100 feet from the brook at a somewhat higher elevation. It is stated that this cesspool is of tight construction, 10 feet square and 10 feet deep and requires cleaning once a year. It is also stated that no overflow takes place, and at the time of the inspection this was apparently true. However, as this house may have as many as 50 boarders at one time in summer, it is evident that if overflowing does not take place there must be considerable seepage into the soil.

The Town brook watershed is roughly rectangular in shape, having an area of 9.2 square miles. There are numerous tributaries to the Town brook which drain this area. The slopes are very steep except in the immediate vicinity of the main brook. About 90 per cent of this watershed is cleared land, a small amount of the area located on the hilltops being covered with timber. There are in all about 30 houses, one church and one schoolhouse located on this watershed, and the estimated population is about 163, giving 17½ persons per square mile. The majority of the houses are situated fairly well back from the stream, and in 3 cases only were decidedly objectionable conditions noted. The first place at which sanitary conditions were unsatisfactory is the C. J. Post farm. At this farm there was a leaching cesspool located on the side hill, and from this cesspool a small stream of water flows through a ditch for several hundred feet directly into a branch of the brook. Another insanitary condition exists at the F. Simmons farm, located about 3 miles above the intake near the head of the main brook. At this point the brook flows within a few feet of the barnyard, from which it undoubtedly receives surface wash. The third point at which the conditions are unsatisfactory is the C. More farm, at which the brook flows directly through the barnyard. Another seriously objectionable feature at this farm is a leaching cesspool which drains directly into a small tributary of the main brook. The water company has already provided the majority of the outside closets on this watershed with removable containers.

At the time of the inspection samples of the water were taken from the two brooks and from a tap in the village. The analyses of these samples, together with those made in the past by the Division of Laboratories and Research, may be found in the accompanying table. The analyses of the raw water show a seriously contaminated condition of these brooks at times. The worst conditions being shown by those analyses made before the improvements to the watershed and water works were carried out. The water of both brooks is soft, somewhat colored and at times turbid. The figures for free and albuminoid ammonia indicate a moderate amount of decomposing organic matter, while the figures for nitrates show at times a fairly high amount of mineralized nitrogen. The figures for oxygen consumed are consistently high, as might be expected in a surface water. The figures for chlorine are also higher than those normally found in this region. The bacterial counts in the raw waters are high and the presence of B. coli indicates active contamination. At the time of the inspection the bacterial count in the Grant brook water was somewhat better than that of the Town brook water. The filtered water showed a moderate bacterial count, less than that of the raw water and with B. coli present in only one inoculation of the 10 c. c. samples.

In view of the above facts the following conclusions may be drawn:

1. That the results of the inspection, together with the analyses of the raw water from both Town and Grant brooks, amply justify the installation of the purification works.
2. That the occurrence of overflowing cesspools on the Town brook watershed at the two farms noted in the report constitutes a serious menace to the water supply derived from that source.
3. That on the watershed of both Town and Grant brooks considerable contamination of animal origin may occur from wash from barnyards, pasture lands and manured fields.
4. That on the Grant brook watershed, on account of its small area and the comparatively short time required for pollution of this brook to reach the filter, the danger arising from accidental contamination is enhanced materially by the presence of the large number of transient visitors.
5. That in view of the recent improvements on the watershed and the installation of the filtration plant it might be possible for the water company to use the Grant brook supply provided the conditions at the farms taking summer boarders were improved, and provided that this supply be protected from contamination by rules and regulations enacted by this Department and strictly enforced by the water company.
6. That, while the filter was giving only a fair removal of bacteria at the time the recent samples were taken, the filtered water was of much better quality than the raw water, although it must be noted that the efficiency of the purification plant cannot be determined by a single set of analyses. It seems probable that on account of the comparatively short period of service of the filter, its biological maturity had not been reached and that with careful operation there seems to be no reason to expect other than satisfactory results after this maturity is obtained.

In conclusion, I would submit the following recommendations:

1. That overflowing cesspools, noted in the report as being present at certain farms on the Town brook watershed, be immediately abandoned and new watertight structures be constructed and located so that no pollution of the stream can take place.
2. That the condition of the two farms on the Grant brook watershed be improved as follows: (a) At the one farm the brook should be protected from the barnyard wash either by relocating the barnyard or by carrying the brook around it through large tile pipe; (b) at the farm at the head of the brook a careful inspection should be made of the cesspool during the summer in order to determine whether this cesspool at any time overflows, and in case such is found to be the case, cleaning should be required and possibly reconstruction and relocation.
3. That the water company continue to give the operation of the filter plant constant care and take every precaution to secure a high degree of efficiency.
4. That this Department enact rules and regulations for the protection of this supply from contamination as requested by the water company.

ALBANY, N. Y., *June* 10, 1914

ANALYTICAL DATA OF WATER SUPPLIES

Abbreviations used to describe odors of water: 0, none; 1, very faint; 2, faint; 3, distinct; 4, decided; 5, strong; 6, very strong; a, aromatic; d, disagreeable; e, earthy; f, fishy; g, grassy; m, musty; v, vegetable

Municipality	County	Source	Date of collection	PHYSICAL				CHEMICAL (PARTS PER MILLION)											BACTERIOLOGICAL			
						ODOR		SOLIDS			NITROGEN AS —						HARDNESS			B. COLI TYPE + = PRESENT — = ABSENT		
				Color	Turbidity	Cold	Hot	Total	Loss on ignition	Mineral residue	Free ammonia	Albuminoid ammonia	Nitrites	Nitrates	Oxygen consumed	Chlorine	Total	Alkalinity	Bacteria per c.c.	10 c.c.	1 c.c.	1-10 c.c.
Hobart........	Delaware......	Tap, Town Brook source....	2/18/10	5	10	....	....	30	12	18	.022	.048	.002	0.60	1.70	1.00	9.5	6.5	5,600	+	+	+
Hobart........	Delaware......	Grant Brook, below old reservoir....	2/18/10	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	7,200	+	+	+
Hobart........	Delaware......	Tap in village..........	2/18/10	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	3,000	+	+	+
Hobart........	Delaware......	Reservoir..........	2/15/10	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	250	+	—	—
Hobart........	Delaware......	Tap..........	2/15/10	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	550	+	—	—
Hobart........	Delaware......	Tap..........	6/ 4/10	Tr.	Cl.	....	....	47	20	27	.002	.080	.002	0.10	0.50	0.75	22.1	20.0	650	+	+	+
Hobart........	Delaware......	Tap, public supply..........	7/18/11	10	Tr.	....	....	51	20	31	.022	.108	.001	0.10	2.00	0.88	29.9	22.0	860	+	+	—
Hobart........	Delaware......	Grant Brook, raw water......	4/28/14	7	2	1 v.	1 v.	35	21	14	.032	.090	.002	1.10	2.50	1.50	12.7	7.0	1,200	3+0—	0+3—	0+3—
Hobart........	Delaware......	Town Brook, raw water......	4/28/14	7	2	1 v.	1 v.	35	16	19	.012	.092	.001	0.70	2.80	1.75	15.6	6.0	500	3+0—	1+2—	0+3—
Hobart........	Delaware......	Town Brook, filtered water..	4/28/14	7	2	1 v.	1 v.	41	15	26	.038	.066	.001	0.70	2.40	1.50	12.7	6.6	110	1+2—	0+3—	0+3—

Copies of the above report were transmitted to Dr. G. L. Hubbell, health officer, and to the Hobart Water Company.

HUDSON FALLS

An inspection of the public water supply of the village of Hudson Falls was made on October 1, 1914.

Hudson Falls is an incorporated village with a population of 5,189 according to the census of 1910. This village is located in the western part of Washington county, about 50 miles north of Albany, upon the east bank of the Hudson river. It is reached by the D. & H. R. R. There are several industries in the village, the principal ones being concerned with the manufacture of paper and paper products. The resident population is increased somewhat during the working hours by mill employes who reside in adjacent communities. The village is served by a system of sewers which discharges untreated sewage into the Hudson river.

The public water supply is derived from springs located about one-half mile north of the village center, the water from these springs being collected in a storage reservoir. An auxiliary supply which was formerly the regular supply is obtained from Cold Brook, about one mile northwest of the center of the village. The water works are owned and operated by the Spring Brook Water Company, of which Mr. B. G. Higley is president and Mr. W. A. Aubrey, superintendent. The original water works, which now constitute the auxiliary supply, were constructed in 1888. The reservoir and pumping station of the present regular supply were constructed in 1905.

Practically the entire population of the village is supplied from this source, although in certain sections there are numerous wells. Considerable water also is supplied to the mills. The average daily consumption may be estimated at about 800,000 gallons. The water is distributed by pumping against a head maintained by a stand pipe located in the village. There are in all 25 miles of cast-iron mains ranging in size from 4 to 12 inches in diameter and from these mains the water is distributed to 1,100 service taps. There are 200 meters installed but of these only 85 are used as a basis for water charges, these being meters on the service pipes of business places and mills. The water pressure ranges from 55 pounds per square inch in the residential district to 70 pounds in the mill district. One of the mills, the Union Bag and Paper Company, has fire pumps supplied from the Hudson river. A check valve separates the distribution system of the mill from that of the village.

The regular water supply is developed by collecting the waters of numerous springs, which rise at the foot of an abrupt bank, through a system of open ditches and a line of tile into the reservoir. The collecting ground upon which these springs are located is about one-half mile long and several hundred feet wide. The Glens Falls feeder of the Champlain canal runs along the top of the bank 20 or 30 feet above the springs.

Numerous surface ditches convey the water from these springs to a line of 10-inch tile which in turn discharges into an open ditch leading into the reservoir. This reservoir is approximately 150 feet wide, 500 feet long and 8 feet deep with an estimated capacity of 3,000,000 gallons. The dam forming this reservoir is a low earth embankment riprapped on its inner slope. At the upper end of the reservoir, at the point where the water enters, a small concrete basin has been built which serves as a sedimentation chamber and as a diversion chamber in case of necessity. At this point the water entering the reservoir is screened through a quarter inch mesh wire screen. The by-pass consists of a line of tile which extends from the inlet to a point below the reservoir.

The intake to the pumps is located at the dam, 15 to 20 feet from the shore in about 10 feet of water. This intake consists of a brick well about 15 feet square surmounted by a brick house. The intake well is divided into three compartments, the first compartment receives the water directly from the reservoir, the second compartment serves as a suction well for the pump and the third compartment has an overflow well from which excess water may flow to waste. The water passing into the suction well of the pumps is screened through ⅛-inch wire screen. The inlet pipe from the reservoir into the well is located about 4 feet above the bottom of the reservoir.

The pumping station is a brick building about 20 feet square located near the reservoir. The pumping equipment consists of 2 Deane triplex pumps operated either by a 75 H. P. Westinghouse induction motor or a 60 H. P. Otto gasoline engine. One pump only is required to furnish the requisite amount of water but the pumping units are in duplicate in order to avoid possible contingencies arising from breakdown or other causes. The head against which the pumping takes place varies from 54 to 80 pounds per square inch, according to the water level in the standpipe. The suction lift is about 5 or 6 feet and both discharge and suction lines are 12 inches in diameter. Each pump has a capacity of about 1,500,000 gallons per day, the number of hours pumping each day ranging from 7 to 20, according to consumption. An engineer is on duty at all hours of the day.

The auxiliary supply is obtained from Cold brook, which is located about one-half mile northwest of the pumping station of the regular supply. Cold brook is only about one-quarter mile long and is probably largely spring fed. This brook flows under the canal, through a masonry culvert, and just south of the canal the water is collected by three reservoirs. At present this supply is used to supplement the regular supply during the winter months of December, January, February and March and at such other times as may be found necessary.

The three reservoirs which impound the waters of Cold brook are known as Numbers 1, 2 and 3 respectively. The brook flows into No. 1 first and from this excess water may be discharged into either No. 2 or No. 3 reservoirs or both. Furthermore, a line of 10-inch tile connects reservoir No. 1 with the spring collecting system of tile which feeds the regular supply impounded in the sewer or No. 4 reservoir. Reservoir No. 1 is approximately 50 feet wide, 75 feet long and 10 feet deep. Reservoir No. 2 covers an irregular area of about ¼ acre and is about 6 feet deep. No. 3 reservoir is 75 feet wide, 100 feet long and about 6 feet deep. This reservoir also collects spring water rising at the foot of the canal bank. The total capacity of these three reservoirs is about 1,000,000 gallons. All three reservoirs have their inner slopes riprapped and No. 1 and No. 2 have short masonry dams. No. 3 reservoir has apparently been excavated below the surface of the surrounding soil and is separated from No. 2 reservoir by a short concrete wall.

The intake from No. 1 reservoir is an open masonry well about 6 feet square, 7 or 8 feet deep and located about 10 feet from shore. The suction pipe of the pump leads from this well to the auxiliary pumping station located near the bank of the reservoir. From this well the tile pipe leads to No. 4 reservoir. In this well there are two valves which can be used to shut off the well from the reservoir and the pipe line leading to No. 4 reservoir. The intake from No. 2 reservoir is similar to that of No. 1 and a separate suction line leads to the pumps. The end of the suction line entering from the intake is covered by a wire screen and probably the same is true of the intake of No. 1. No intake exists at No. 3 reservoir, although connections with No. 1 and No. 2 reservoirs allow this reservoir to be used as a part of either or both of the others. At this reservoir a small concrete pit serves as a means of connecting it with a pipe line leading from No. 1 to No. 4 reservoirs. In this pit there are valves controlling the discharge of water from this reservoir.

The auxiliary pumping station is a brick building about 20 feet by 40 feet containing two Worthington duplex compound pumps with a capacity when new of about 1,000,000 gallons per day each. The pumps are driven by steam generated in two 60 H. P. boilers. The discharge main is 10 inches in diameter.

The stand pipe located in the village is of steel, 18 feet in diameter, 120 feet high, with a capacity of 230,000 gallons. The reservoirs are cleaned once a year and the dead ends in the distribution system are flushed about every two weeks during the warmer months. The whole distribution system is flushed about once a month.

The inspection was made by Mr. E. S. Chase, assistant engineer in this Department, in connection with the policy of this Department of making voluntary inspections of the various public water supplies of the state. The assistant engineer was accompanied and aided in this inspection by Mr. Aubrey, superintendent for the water company.

Before the report of this investigation of October 1 was completed, an epidemic of gastro-intestinal enteritis broke out in Hudson Falls. In connection with the investigation of this outbreak it was deemed advisable to make a still further inspection of the water supply with the view of discovering the possible sources of infection in case the epidemiological evidence pointed to the public water supply as the cause of the outbreak. This supplementary inspection was made by Mr. Chase, on October 23, 24 and 27, information and assistance being given by Dr. R. A. Heenan, health officer of the village, and Mr. Aubrey, superintendent of the water company. The investigation of the outbreak was carried on by Dr. C. S. Prest, sanitary supervisor of the district, and the data collected by him pointed strongly to the public water supply as the cause of the outbreak.

The water supply situation at Hudson Falls offers a somewhat complex problem. The original source of a large amount of the water issuing from the springs is undoubtedly the canal. However, the topography of this region would indicate that a ground water flow occurs from the sandy plain located beyond the canal, above and to the north of the water works, and it seems probable that a certain amount of this ground water also reaches the springs. The two chief reasons advanced against the canal being the source of supply for these springs are: first, that the springs continue to flow in the winter when the canal is dry; second, that if leakage occurred through the banks of the canal such leaks would develop so rapidly as to completely wash out the sandy bank in a very short time. The first reason does not take into consideration the fact that the sandy plain to the north forms a natural storage for seepage water from the canal and for rain water and that the flow of the springs in winter is water that has been thus stored. The second reason starts with the erroneous assumption that the leakage occurs through well-defined channels. Although leakage of this description has occurred at times the ordinary leakage supplying the springs is unquestionably that which is brought about by infiltration all along the inner slopes of the canal. At certain points along the outer slope of the canal bank this leakage finds lines of least resistance and issues forth from the bank in well-defined streams.

The evidence upon which is based the conclusion that the canal feeder is the chief source of the spring water may be presented as follows: first, the nearness of these springs to the feeder, the porous character of the material forming the canal bank, and the 15 or 20 feet elevation of the canal level above the springs; second, the existence of a large flow from the springs even after an extended period of drought indicating a practically inexhaustible supply; third, the marked diminution of flow in winter when the canal feeder is drained; fourth, that the largest springs are located at points where large leaks have taken place in the past and where many loads of rock have been dumped.

The water supplying the feeder is taken from the Hudson river about two miles above Glens Falls. At this point the Hudson has received sewage from the villages of Corinth, Luzerne and Warrensburg as well as the general run-off from numerous small hamlets located along the river. Although the sewage of Glens Falls is discharged into the river below the feeder intake, considerable pollution must reach the canal as it flows through the city. Further contamination of the canal water may be caused by several privies located close to the bank of the canal and by the discharge of human excreta from canal boats or along the towpath.

In view of the fact that the canal is largely the source of the water supply springs, it is evident that their sanitary quality will depend to a considerable degree upon the efficiency of the purification brought about during the passage of the canal water through the bank. While the physical quality of the spring water is apparently satisfactory, complete and satisfactory purification does not take place as evidenced by numerous recent and past analyses, the results of which will be discussed in detail later in this report.

In addition to the danger arising from incomplete purification, there also exists the possibility of contamination of an accidental or wilful nature. The proximity of the springs to the canal tow path and the nearness of the water works to the village afford ample opportunity for trespassing with its attendant danger. At one point on the tow path opposite Reservoir No. 4 human excrement was noted. This shows clearly the strong possibility of serious and concentrated contamination from just such chance sources.

At the time of the second inspection about 30 piles of manure were noticed on the land just west of reservoir No. 4 and a small amount of manure was also noticed to the southeast of the reservoir. The drainage from the manure piles west of the reservoir would probably be away from it, although one pile near the southern end of the reservoir was located only 23 feet from the water's edge and about 1½ feet above the water level. The manure to the southeast of the reservoir was so placed that drainage from it would either be washed over the surface or seep through porous soil into the reservoir.

The auxiliary supply is open to certain other sources of contamination in addition to those to which the regular supply is subject. The surface drainage area of Cold brook is a level plain of sand and gravel overlying limestone. This watershed is approximately 1.2 square miles in area and upon it are located about 50 houses with an estimated population of 250, or 200 per square mile. As the majority of these houses are well back from the stream the presence of this large population on the watershed probably affects the character of the ground water to a greater extent than the surface run-off. Although at times of heavy rainfall, especially when the ground is frozen, the drainage from the vicinity of a few houses and the highways crossing the area would reach the stream, the porous character of the soil allows moderate rainfall to sink quickly into the ground and consequently it is probable that the brook is fed largely by ground water.

At the auxiliary pumping station the privy of the engineer's house is located but 20 feet from the edge of reservoir No. 2. This privy is cleaned frequently but the excretal matters are then buried in the soil not over 50 feet from reservoir No. 1.

For about one-quarter of a mile above the pumping station the water company owns and has fenced off the land bordering the brook and upon this area several thousand young pine trees have been set out.

Some complaints have been made regarding alleged insufficiency of the flushing of the water mains and infrequent cleaning of the standpipe. These are matters which affect the esthetic rather than the sanitary quality of the supply.

At the time of the inspection numerous samples of the water were collected and the results of the analyses of these samples together with those made in the past by the Division of Laboratories and Research are given in the appended table.

The complex character of the water is indicated by the variations in the analytical results. The difficulty of interpreting exactly the chemical data is increased by the irregular use of the water from the auxiliary supply. It may be stated, however, that during the months of December, January, February and March a much greater proportion of the Cold Brook supply is used than during the rest of the year and that during the winter both supplies consist largely of the ground water flow from the sandy plain.

From the average of the determinations for nitrates, chlorine and oxygen consumed in the past analyses, the following table may be drawn:

RESULTS OBTAINED FOR SAMPLES

	Dec., Jan., Feb. and Mar.	Rest of Year
Nitrates	1.11	0.76
Chlorine	5.75	2.80
Oxygen consumed	2.12	3.70

The higher figures for nitrates and chlorine and the lower figures for oxygen consumed in winter show the greater proportion of ground water during the months when the canal feeder is empty.

For the purpose of comparing the water from the two sources of supply and from the canal the following table has been made:

REPORT OF WATER ANALYSIS FOR HUDSON FALLS

Laboratory No. Source	Canal feeder	Reservoir No. 4 water at pump station	Reservoir No. 4 water supply in village	Reservoir No. 1 Cold Brook water
Collected on	10/23/14	10/23/14	10/1/14	10/1/14
Color	18	18	8	8
Turbidity	Trace	Trace	Trace	Trace
Odor, cold	2 v.	1 v.	1 v.	1 v.
Odor, hot	2 v.	1 v.	1 v.	1 v.
Solids, total	52	72	65	107
Loss on ignition	25	20	10	34
Mineral residue	27	52	55	73
Ammonia, free	.008	.004	.004	.012
Ammonia, albuminoid	.064	.036	.030	.024
Nitrites	.001	.001	.001	.001
Nitrates	0.06	0.24	0.30	1.00
Oxygen consumed	10.20	5.20	4.50	2.65
Chlorine	0.50	1.50	2.00	4.25
Hardness, total	24.7	29.9	28.4	47.1
Alkalinity	15.0	29.0	31.0	42.0
Bacteria per c.c.	2,100	350	300	450
B. coli type 10 c.c.	3+0—	3+0—	3+0—	3+0—
1 c.c.	3+0—	1+2—	2+1—	0+3—
1/10 c.c.	3+0—	0+3—	0+3—	0+3—

Results are expressed in parts per million. + Present. — Absent.

Abbreviations used to describe odors of water: 0, none; 1, very faint; 2, faint; 3, distinct; 4, decided; 5, strong; 6, very strong; a, aromatic; d, disagreeable; e, earthy; f, fishy; g, grassy; m, musty; v, vegetable.

These analyses show that the analytical results of the water of the regular supply resemble much more closely those of the canal water than those of the Cold brook supply.

In general it may be said that the analyses show a mixture of ground and surface water. The high figures for nitrates and chlorine indicate considerable past pollution of the ground water due to the well-populated watershed from which the water drains. It is impossible to state the completeness of the purification of this pollution during the passage of the ground water through the soil owing to the mixture of this ground water with surface water.

The analyses do show, however, the almost constant presence of active contamination, as evidenced by the high bacterial counts and the frequent occurrence of organisms of the B. coli type in samples as small as 1 c.c. and occasionally 1/10 c.c. This contamination is largely due to insufficient purification of the canal water as it seeps through the bank, as is evidenced by the analyses of the samples of certain of the springs taken as they flowed from the bank. After rains further contamination may reach both sources of the supply from surface wash, and this fact accounts for the continuance of contamination during the time when the canal is drained.

The distribution throughout the year of the intensity of contamination is shown by the following table:

PER CENT. OF SAMPLES WITH B. COLI PRESENT

	10 c. c.	1 c. c.	1/10 c. c.
Samples taken in Dec., Jan., Feb. and Mar.	80	30	0
Rest of year	89	50	17

This table shows a somewhat less amount of active contamination during the winter months, when the canal is drained, than during the rest of the year, thus affording further evidence as to the origin of much of the so-called spring water.

In view of the above considerations the following conclusions may be drawn:

1. That the public water supply of Hudson Falls originates from three sources, namely, surface water, ground water, and infiltered canal water, the proportions of which vary from time to time according to the season of the year, rainfall and operation of the canal.

2. That past and recent analyses show the continued presence of considerable contamination of animal or human origin due to insufficient purification of the canal water and to surface wash at times of rainfall.

3. That specific sources of probable pollution exist at the water works themselves, namely:

(a) The privy located near reservoir No. 2 and the method of disposal of material removed therefrom.

(b) The manure placed on the land bordering and sloping towards reservoir No. 4.

(c) The opportunity for accidental or wilful contamination by trespassers due to the nearness of the water works to the village and to the towpath of the canal.

4. That the facts brought out by this investigation bear out the epidemiological evidence indicating the water supply as the cause of the recent outbreak of enteritis, although the possible sources of contamination are too numerous to ascribe to any one in particular the responsibility for the outbreak.

I would therefore recommend:

1. That, owing to the numerous and variable sources of contamination to which the supply is subject and the difficulty if not impossibility of preventing or removing these sources, a careful study be given the problem by a competent engineer. This study should include an inquiry into the possibility and economy of purification of this supply under all conditions which may arise, as against the abandonment of this supply and the introduction of a new supply free from contamination at all times and under all conditions.

2. That if, after investigation, it is found safe to retain the present supply, the water company carry out the following protective measures:

(a) Remove the privy at the engineer's house near reservoir No. 2 to a greater distance from the reservoir and provide it with removable containers, the contents of which should be disposed of by burying in the soil at some point off the watershed.

(b) Discontinue the practice of placing manure on land sloping toward the reservoirs or towards any of the springs feeding them.

(c) Reduce to a minimum the danger from trespassers in the vicinity of the springs and reservoirs by posting signs, maintaining regular and frequent patrol and adequately fencing off the property.

3. That, if it is found advisable to retain the present supply or until a new and safe supply is secured, apparatus for the sterilization of the supply by liquid chlorine or some other equally efficient method be installed and carefully and constantly operated.

4. That, as a means of effective control of this purification process, and in order to determine the adequacy of the treatment, regular and systematic bacterial analyses be made of both the raw and treated water.

ALBANY, N. Y., *November* 17, 1914

RESULTS OF WATER ANALYSES

Abbreviations used to describe odors of water: 0, none; 1, very faint; 2, faint; 3, distinct; 4, decided; 5, strong; 6, very strong; a, aromatic; d, disagreeable; e, earthy; f, fishy; g, grassy; m, musty; v, vegetable

Municipality	County	Source of sample	Date of collection	PHYSICAL				CHEMICAL (PARTS PER MILLION)											BACTERIOLOGICAL			
						ODOR		SOLIDS			NITROGEN AS —						HARDNESS			B. COLI TYPE + = PRESENT — = ABSENT		
				Color	Turbidity	Cold	Hot	Total	Loss on ignition	Mineral residue	Free ammonia	Albuminoid ammonia	Nitrites	Nitrates	Oxygen consumed	Chlorine	Total	Alkalinity	Bacteria per c.c. gelatin 20° 48 hours	10 c.c.	1 c.c.	1-10 c.c.
Hudson Falls	Washington	Tap, public supply	5/ 4/08	12	2	....	....	113	....	....	.016	.078	.005	1.50	2.90	5.25	50.0	......	210	—	—	—
Hudson Falls	Washington	Tap, public supply	1/ 5/09	8	Cl.	....	....	89	....	66	.016	.042	.003	1.60	2.10	4.25	37.7	31.5	800	+	+	—
Hudson Falls	Washington	Tap, public supply	2/ 3/10	5	Tr.	....	....	88	....	55	.028	.042	.002	1.20	2.60	3.75	39.0	35.0	600	—	—	—
Hudson Falls	Washington	Tap, public supply	9/13/10	15	1	....	....	84	11	73	.002	.068	0.01	0.48	3.25	1.63	40.3	31.0	170	+	+	+
Hudson Falls	Washington	Tap, public supply	12/28/10	10	Tr.	....	....	87	33	54	.026	.026	0.02	0.20	2.65	4.00	42.9	32.0	550	+	+	—
Hudson Falls	Washington	Tap, public supply	2/ 7/11	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1,300	+	+	—
Hudson Falls	Washington	Tap, public supply	4/27/11	10	....	....	....	84	26	58	.006	.042	.002	1.20	2.80	4.00	45.7	37.0	60	+	—	—
Hudson Falls	Washington	Tap, public supply	7/ 6/11	15	5	....	....	79	14	65	.018	.042	.002	0.50	4.00	1.75	50.0	27.5	300	+	+	—
Hudson Falls	Washington	Tap, public supply	8/31/11	15	....	....	....	87	25	62	.020	.062	.002	0.50	5.00	2.25	35.1	35.0	1,400	+	+	+
Hudson Falls	Washington	Tap, public supply	10/ 4/11	15	25	....	....	77	10	67	.004	.028	.001	0.40	3.60	2.25	42.9	33.0	300	+	+	+
Hudson Falls	Washington	Tap, public supply	11/ 9/11	15	Tr.	....	....	99	27	72	.002	.066	.001	0.60	3.00	2.75	41.6	32.0	160	+	+	—
Hudson Falls	Washington	Tap, public supply	12/14/11	20	Tr.	....	....	74	10	64	.044	.058	.002	0.40	2.20	2.50	37.7	37.0	400	+	—	—
Hudson Falls	Washington	Tap, public supply	1/ 8/12	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	150,000	+	—	—
Hudson Falls	Washington	Tap, public supply	1/31/12	10	Cl.	....	....	103	30	73	.020	.036	.001	1.44	1.30	4.50	47.1	37.0	170	+	—	—
Hudson Falls	Washington	Tap, public supply	3/12/12	Tr.	Cl.	....	....	92	17	75	.022	.058	.001	1.20	1.60	5.00	42.9	37.0	4,000	+	—	—
Hudson Falls	Washington	Tap, public supply	4/19/12	15	Tr.	....	....	131	40	91	.008	.024	.001	1.20	2.90	3.25	72.9	51.0	60	—	—	—
Hudson Falls	Washington	Tap, public supply	9/18/12	20	Tr.	....	....	85	24	61	.002	.026	.001	0.40	4.10	2.00	36.4	31.0	1,000	+	+	—
Hudson Falls	Washington	Tap, public supply	11/13/12	20	Tr.	....	....	100	22	78	.014	.096	.001	1.00	4.50	2.50	60.0	41.0	500	+	—	—
Hudson Falls	Washington	Tap, public supply	12/28/13	10	Cl.	....	....	101	24	77	.010	.058	.001	1.40	2.50	4.00	48.6	40.0	350	—	—	—
Hudson Falls	Washington	Tap, public supply	2/18/13	10	Cl.	1 v.	1 v.	112	....	....	.012	.024	.001	1.40	2.00	5.75	52.9	39.0	80	1+2—	0+3—	0+3—
Hudson Falls	Washington	Tap, public supply	4/24/13	7	Cl.	1 v.	1 v.	118	....	....	.018	.040	.001	1.30	1.80	4.50	61.4	42.0	1,100	1+2—	0+3—	0+3—
Hudson Falls	Washington	Tap, public supply	7/27/13	10	2	1 v.	1 v.	72	....	....	.006	.058	.001	0.60	2.90	2.75	37.7	28.0	90	3+0—	2+1—	0+3—
Hudson Falls	Washington	Tap, public supply	4/ 9/14	25	1	1 v.	1 v.	101	21	80	.052	.092	.001	1.20	5.30	3.50	55.7	35.0	160	1+2—	0+3—	0+3—
Hudson Falls	Washington	Reservoir, Cold brook supply	10/ 1/14	8	Tr.	1 v.	1 v.	107	34	73	.012	.024	.001	1.00	2.65	4.25	47.1	42.0	450	3+0—	0+3—	0+3—

Hudson Falls..	Washington...	Canal feeder above Glens Falls..................	10/23/14	....	....	....	....	....	....	....	....	....	....	....	.....	......	......	......	425	3+0—	3+0—	3+0—
Hudson Falls..	Washington...	Canal feeder, opposite pump station, Hudson Falls.....	10/23/14	18	Tr.	2 v.	2 v.	52	25	27	.008	.064	.001	0.06	10.20	0.50	24.7	15.0	2,100	3+0—	3+0—	3+0—
Hudson Falls..	Washington...	Spring at south end reservoir No. 4..................	10/23/14	....	....	....	....	....	....	....	....	....	....	....	.....	......	......	......	375	3+0—	2+1—	1+2—
Hudson Falls..	Washington...	Tap at pump station........	10/23/14	18	Tr.	1 v.	1 v.	72	20	52	.004	.036	.001	0.24	5.20	1.50	29.9	20.0	350	3+0—	1+2—	0+3—
Hudson Falls..	Washington...	Tap at hotel, public supply..	10/24/14	....	....	....	....	....	....	....	....	....	....	....	.....	......	......	......	160	3+0—	1+2—	0+3—
Hudson Falls..	Washington...	Tap at Union Bag & Paper Co	10/24/14	....	....	....	....	....	....	....	....	....	....	....	.....	......	......	......	190	2+1—	0+3—	0+3—
Hudson Falls..	Washington...	Hudson river at Union Bag & Paper Co..............	10/24/14	....	....	....	....	....	....	....	....	....	....	....	.....	......	......	......	2,400	3+0—	3+0—	3+0—
Hudson Falls..	Washington...	Canal feeder opposite pump station..............	10/22/14	....	....	....	....	....	....	....	....	....	....	....	.....	......	......	......	550	3+0—	3+0—	2+1—
Hudson Falls..	Washington...	Spring flowing from canal bank..................	10/28/14	....	....	....	....	....	....	....	....	....	....	....	.....	......	......	......	350	3+0—	1+2—	0+3—
Hudson Falls..	Washington...	Tap in hotel, public supply..	10/28/14	....	....	....	....	....	....	....	....	....	....	....	.....	......	......	......	250	3+0—	1+2—	0+3—
Hudson Falls..	Washington...	Tap, public supply from reservoir No. 4..............	10/ 1/14	8	Tr.	1 v.	1 v.	65	10	55	.004	.030	.001	0.30	4.50	2.00	36.4	31.0	300	3+0—	2+1—	0+3—

Copies of the above report were transmitted through Dr. Chas. S. Prest, sanitary supervisor to the Spring Brook Water Company, and to Dr. R. A. Heenan, health officer.

JOHNSTOWN

An inspection of the public water supply of Johnstown, N. Y., was made on June 8, 1914.

Johnstown is a city of about 12,500 inhabitants, located in the mid-southern part of Fulton county on the Fonda, Johnstown and Gloversville electric railroad. This city is a manufacturing city, the principal industries being glove manufacture, knitting mills and leather works. The city has a combined sewer system which discharges into the Cayadutta creek.

The water works were constructed in 1878 by contract under the direction and after designs of the city engineer. Additional reservoirs were constructed in 1893 and 1895. The water works are under the control of the board of water commissioners, of which Mr. L. K. Maylender is president and Mr. Edgar Hodges is superintendent.

The water supply is derived from two brooks located 3 and 5 miles, respectively, west of the village. The water is distributed by gravity through about 28 miles of cast-iron mains ranging in size from 4 to 16 inches in diameter. The number of service taps is 2,280, of which 231 are metered. Practically the entire population is served by the public water supply and the average daily consumption is estimated at 2,000,000 gallons, fully one-half of which is used by the mills and factories. The pressure in the mains ranges from 110 to 150 pounds per square inch.

There are three reservoirs connected with the water supply, namely, the Cold brook, Warren and Cork Center reservoirs. The Cold brook reservoir, which is the original reservoir constructed in 1878, is no longer used except as an emergency supply, and the same is true of the Warren reservoir, which was constructed in 1893. Both these reservoirs are open impounding reservoirs with capacities of 10,000,000 gallons and 2,500,000 gallons, respectively, fed by the Cold and Warren brooks and located about 3 miles from the city. These reservoirs are not used on account of occasional tastes and odors and the occasional high turbidity. The present supply is derived from an intake on Cold brook above the old reservoir and from the Cork Center reservoir, constructed in 1895, which impounds the Cork Center brook about 5 miles from the city.

The Cold brook intake is a small masonry basin, approximately 30′ x 10′ x 4′ deep, formed by a small masonry dam. This intake basin is provided with a 10″ mud pipe and valve for cleaning. A small brick screen house contains three screens of ¼ and ½ inch mesh, respectively. From this intake the water is conducted through about 1,200 feet of 12″ tile laid with open joints, then through about 4,000 feet of cast-iron pipe to the main leading to the city below the Cold brook reservoir.

The Cork Center reservoir is about ¾ of an acre in area and 12 feet deep in its deepest part, and with a capacity of 700,000 gallons. It is formed by an earthen dam, the side slopes are stone lined and the bottom puddled with clay. This reservoir is provided with a spillway and small catch basin on the stream above and a by-pass for use at times of cleaning.

The construction of a new intake basin on Warren brook is now being carried on and will be completed sometime this summer. When this intake is completed water from Warren brook will be by-passed around the reservoir and fed directly to the main to the city. The object of carrying the intake up-stream and by-passing the reservoir is to receive a supply which will be less affected by surface wash and by the organic growths which at times occur in the reservoir.

The Cork Center reservoir is cleaned out every year in the spring and the Cold brook intake is cleaned out every week. The water mains in the city are flushed once a month in summer and at irregular intervals in winter. There are 4 men employed regularly in taking care of the system, whose duties consist of making house connections, flushing mains and attending to the reservoirs and intakes.

The inspection was made by Mr. E. S. Chase, assistant engineer in this Department, accompanied by Mr. Edgar Hodges, superintendent, and Mr. Grover Yerdon, clerk of the board of water commissioners. On this inspection the various reservoirs and watersheds were visited.

The watershed on Cold brook above the intake is approximately 0.15 miles in area, almost entirely covered with timber. There are no houses located upon it and, as far as could be ascertained, little opportunity of permanent contamination.

The Cork Center watershed is approximately 3.05 square miles in area, rectangular shaped, about 3 miles long and one mile wide. The slopes are moderate near the stream but rather abrupt around the perimeter of the watershed. The soil is largely sand and gravel and this area is becoming almost entirely covered with trees. Every year about 50,000 young pines are planted by the water commissioners. The city owns in all about 1,200 acres of watershed. With two exceptions all the houses which formerly existed upon this watershed have been purchased and destroyed by the city. Neither of the existing houses is located so as to bring about any probable pollution of the stream and only one is occupied. This occupied house, which has but two inhabitants, is near the head of the brook and the course of the drainage from this place is not clearly defined. Three highways cross this watershed and some pollution may be caused from surface wash from these sources. The city has closed two highways which formerly followed the stream rather closely a short distance above the intake. The land upon this watershed was formerly devoted to farming. No trespassing is allowed upon the watersheds owned by the city and the superintendent or an employe visits the intake practically every day.

The Warren brook watershed above the new intake is 0.2 square miles in area, located upon a side hill. This area is well wooded, with steep slopes and rocky surface. It is uninhabited and there seems to be little opportunity for the pollution of this stream from permanent sources. There is, however, the danger which might occur from pollution of the area above the intake with the excretal matters of the workmen engaged upon the construction work.

At the time of the inspection samples were taken from Cold brook and Cork Center brook and from a tap in the city. The results of these analyses, together with the analyses made in the past by the Division of Laboratories and Research will be found in the accompanying table. Just previous to the collection of the samples on June 8, 1914, a heavy shower had taken place and a heavy rainfall had occurred on the preceding night.

These analyses show a water of rather high hardness, moderate color, practically free from turbidity, with moderate, although somewhat variable figures for nitrogen in its various forms, with moderate amounts of undecomposed organic matter and with chlorine present in somewhat larger amounts than are normally present in waters of this part of the State. The bacterial results are variable, at times rather high, and the presence of organisms of the B. coli type in samples as small as 1 c. c. indicate the occasional presence of active contamination. In the past this contamination probably came from the farms located upon the watersheds of Cork Center brook. Contamination in samples taken since the improvement of the watershed can be explained only by the surface wash from highways or from animal sources, and it may be noticed that the bacterial results during the past two or three years show a marked improvement over those obtained in earlier years.

In view of the above facts, the following conclusions may be drawn:

1. That the sanitary conditions upon Cold brook and Cork Center brook watersheds are such as should insure a water supply of a sanitary quality entirely suitable for the city supply.
2. That the contamination occasionally present is probably due to animal rather than human sources and, on the whole, is of comparatively little significance.
3. That during the construction of the new intake on Warren brook there is a decided possibility of contamination of the land in the vicinity

of this intake by the excretal discharges of laborers engaged upon this work, and that such contamination would undoubtedly reach the water supply when this intake should be put into service.

In view of the above conclusions, I beg to make the following recommendations:

1. That the board of water commissioners continue to carry out their commendable policy of reforestation and of removing all sources of contamination from the watersheds and to protect them as much as possible from any accidental or wilful sources of contamination by enforcing their rules against trespassing.
2. That during the construction of the new Warren brook intake every precaution be taken to avoid contamination of the ground in the vicinity of this intake by the laborers and the possibility of such contamination would be reduced to a minimum by constructing and requiring the use of sanitary toilets for the men at a safe distance below the new intake.
3. That, before the use of water from this new intake is allowed, careful inspection of the land, in its vicinity, be made to discover any possible contaminating material, that such material be removed and the places thoroughly disinfected, and that the water from this intake be wasted for at least two weeks before introduction into the city mains.

ALBANY, N. Y., *June* 20, 1914

ANALYTICAL DATA OF WATER SUPPLIES

Abbreviations used to describe odors of water: 0, none; 1, very faint; 2, faint; 3, distinct; 4, decided; 5, strong; 6, very strong; a, aromatic; d, disagreeable; e, earthy; f, fishy; g, grassy; m, musty; v, vegetable

Municipality	County	Source	Date of collection	Physical				Chemical (Parts Per Million)											Bacteriological			
						Odor		Solids			Nitrogen as —						Hardness			B. Coli Type + = present — = absent		
				Color	Turbidity	Cold	Hot	Total	Loss on ignition	Mineral residue	Free ammonia	Albuminoid ammonia	Nitrites	Nitrates	Oxygen consumed	Chlorine	Total	Alkalinity	Bacteria per c.c.	10 c.c.	1 c.c.	1-10 c.c.
Johnstown	Fulton	Tap, city supply	7/18/07	12	5	....	....	106	....	....	.008	.074	Tr.	0.08	3.50	0.37	65.7	......	7,200	+	—	......
Johnstown	Fulton	Drinking fountain, West State street	9/25/07	....	....	....	....	....	....	....	....	....	....	....	....	....	....	......	3,300	+	+	+
Johnstown	Fulton	Tap, city supply	9/25/07	....	....	....	....	....	....	....	....	....	....	....	....	....	....	......	4,800	+	+	—
Johnstown	Fulton	Cork Center reservoir	9/25/07	10	5	....	....	97	....	....	.002	.033	Tr.	0.04	3.60	0.50	64.3	......	9,000	+	+	+
Johnstown	Fulton	Tap, public supply	3/ 9/08	3	8	....	....	91	....	....	.020	.114	.001	0.14	3.90	0.37	65.0	......	170	+	—	—
Johnstown	Fulton	Tap, public supply	6/23/08	5	2	....	....	113	....	....	.018	.018	Tr.	0.16	0.90	0.37	97.1	......	......	......	......	—
Johnstown	Fulton	Cork Centre creek above reservoir	6/23/08	....	....	....	....	....	....	....	....	....	....	....	....	....	....	......	69,000	+	+	—
Johnstown	Fulton	Cold brook intake	6/23/08	....	....	....	....	....	....	....	....	....	....	....	....	....	....	......	86,500	+	+	—
Johnstown	Fulton	Cold brook intake	12/ 8/08	....	....	....	....	....	....	....	....	....	....	....	....	....	....	......	3,800	+	+	—
Johnstown	Fulton	Cork Centre reservoir	12/ 8/08	....	....	....	....	....	....	....	....	....	....	....	....	....	....	......	180	+	+	—
Johnstown	Fulton	Tap, public supply	12/ 9/08	10	1	....	....	82	....	....	.020	.078	.001	0.10	2.90	1.00	60.0	......	......	......	......	—
Johnstown	Fulton	Cold brook system	4/ 7/09	....	....	....	....	....	....	....	....	....	....	....	....	....	....	......	375	+	—	—
Johnstown	Fulton	Cork Centre reservoir	4/ 7/09	....	....	....	....	....	....	....	....	....	....	....	....	....	....	......	2,700	+	—	—
Johnstown	Fulton	Tap, public supply	1/ 5/10	5	Cl.	....	....	110	20	90	.034	.032	.002	.20	1.35	1.50	80.0	79.0	275	+	—	—
Johnstown	Fulton	Tap, public supply	6/30/10	Tr.	Cl.	....	....	113	8	105	.004	.012	.005	.04	1.00	0.50	98.6	93.0	500	—	—	—
Johnstown	Fulton	Tap, public supply	9/ 7/10	10	5	....	....	115	21	94	.004	.094	Tr.	.04	2.60	0.25	91.4	81.0	26,000	+	+	+
Johnstown	Fulton	Tap, public supply	11/ 2/10	Tr.	Cl.	....	....	92	9	83	.004	.042	.002	.10	1.00	1.25	81.4	81.0	60	+	+	—
Johnstown	Fulton	Tap, public supply	12/29/10	5	Tr.	....	....	103	28	75	.084	.130	.002	.20	1.50	0.75	74.3	73.0	350	+	—	—
Johnstown	Fulton	Tap, public supply	4/ 6/11	8	Tr.	....	....	87	19	68	.012	.054	.001	0.10	2.10	1.50	64.3	61.0	300	+	—	—
Johnstown	Fulton	Tap, public supply	6/ 1/11	Tr.	Cl.	....	....	116	18	98	.010	.034	.001	0.10	0.70	0.50	97.1	94.0	275	+	+	—
Johnstown	Fulton	Tap, public supply	7/ 7/11	5	Tr.	....	....	73	11	62	.004	.010	.001	0.10	0.30	0.63	60.0	58.0	400	+	+	—
Johnstown	Fulton	Tap, public supply	8/31/11	5	Cl.	....	....	118	15	103	.010	.030	.003	0.10	0.30	1.50	98.6	96.0	350	+	—	......

ANALYTICAL DATA OF WATER SUPPLIES

Abbreviations used to describe odors of water: 0, none; 1, very faint; 2, faint; 3, distinct; 4, decided; 5, strong; 6, very strong; a, aromatic; d, disagreeable; e, earthy; f, fishy; g, grassy; m, musty; v, vegetable

Municipality	County	Source	Date of collection	PHYSICAL				CHEMICAL (PARTS PER MILLION)											BACTERIOLOGICAL			
						ODOR		SOLIDS			NITROGEN AS —						HARDNESS			B. COLI TYPE + = PRESENT — = ABSENT		
				Color	Turbidity	Cold	Hot	Total	Loss on ignition	Mineral residue	Free ammonia	Albuminoid ammonia	Nitrites	Nitrates	Oxygen consumed	Chlorine	Total	Alkalinity	Bacteria per c.c.	10 c.c.	1 c.c.	1-10 c.c.
Johnstown....	Fulton........	Tap, public supply.........	10/24/11	10	Cl.	....	....	70	21	49	.010	.066	.001	0.06	3.50	2.00	39.0	33.0	375	+	.....	.....
Johnstown.....	Fulton........	Tap, public supply.........	12/21/11	22	Cl.	....	....	104	27	77	.020	.046	.001	0.08	2.30	0.50	62.9	46.0	100	+	—	—
Johnstown.....	Fulton........	Tap, public supply.........	2/ 2/12	Tr.	Cl.	....	....	104	11	93	.018	.016	Tr.	0.16	0.60	0.50	81.4	81.0	160	+	—	—
Johnstown.....	Fulton........	Tap, public supply.........	4/ 6/12	15	Tr.	....	....	51	10	41	.016	.052	Tr.	0.20	3.20	0.25	39.0	34.0	400	+	+	—
Johnstown.....	Fulton........	Tap, public supply.........	6/22/12	Tr.	Cl.	....	....	119	10	109	.002	.002	.001	0.14	0.60	0.50	90.0	88.0	40	—	—	—
Johnstown.....	Fulton........	Tap, public supply.........	9/13/12	5	Tr.	....	....	139	20	119	.002	.006	.001	0.12	1.10	0.50	111.4	97.0	650	+	+	—
Johnstown.....	Fulton........	Tap, public supply.........	11/ 1/12	5	Cl.	....	....	88	16	72	.014	.062	.001	0.08	1.90	1.00	67.1	65.0	110	+	—	—
Johnstown.....	Fulton........	Tap, public supply.........	12/12/12	5	Cl.	....	....	81	11	70	.010	.048	Tr.	0.12	2.50	0.75	61.4	55.0	80	—	—	—
Johnstown.....	Fulton........	Tap, public supply.........	1/24/13	15	Cl.	1 v.	1 v.	65	....	....	.010	.056	.001	0.10	2.40	0.50	44.3	43.0	375	2+1—	0+3—	0+3—
Johnstown.....	Fulton........	Tap, public supply.........	3/ 5/13	3	Cl.	1 v.	1 v.	95	....	....	.020	.026	Tr.	0.14	0.80	0.25	67.1	66.0	250	1+2—	0+3—	0+3—
Johnstown.....	Fulton........	Tap, public supply.........	4/ 4/13	10	Tr.	2 v.	2 v.	78	....	....	.012	.042	Tr.	0.08	2.00	0.50	47.1	47.0	80	0+3—	0+3—	0+3—
Johnstown.....	Fulton........	Tap, public supply.........	5/ 1/13	15	Tr.	1 v.	1 v.	72	....	....	.004	.048	Tr.	0.06	2.20	0.25	55.7	50.0	425	2+1—	1+2—	0+3—
Johnstown.....	Fulton........	Tap, public supply.........	6/12/13	5	Tr.	2 a.	2 a.	106	....	....	.008	.012	Tr.	0.10	1.20	0.50	77.1	......	1,000	2+1—	0+3—	0+3—
Johnstown.....	Fulton........	Tap, public supply.........	6/ 8/14	7	1	1 a.	1 a.	118	23	93	.002	.022	Tr.	0.12	1.00	0.50	87.1	86.0	70	3+0—	1+2—	0+3—
Johnstown.....	Fulton........	Cold brook intake..........	6/ 8/14	5	1	2 a.	2 a.	123	21	102	.002	.012	Tr.	0.10	0.70	0.75	100.0	99.0	40	3+0—	0+3—	0+3—
Johnstown.....	Fulton........	Cork Centre reservoir.......	6/ 8/14	10	2	1 v.	1 v.	109	17	92	.006	.036	Tr.	0.10	2.00	0.50	77.1	75.0	90	3+0—	1+2—	0+3—

Copies of the above report were transmitted to the local board of water commissioners and to Dr. M. Somers, health officer.

LAURENS

An inspection of the public water supply of the village of Laurens, N. Y., was made on April 29, 1914.

Laurens is an incorporated village of about 250 inhabitants located in the south central part of Otsego county, ten miles north of the city of Oneonta, from which it may be reached by the Otsego and Herkimer Electric railroad. The village has no public system of sewers and is served by outside closets and cesspools, in many cases abandoned wells being used to receive the sewage discharges from the houses.

The public water supply is owned by the municipality and is under the control of the board of trustees of the village, of which Mr. Welcome Parish is president. These water works were designed by E. S. Musson, C. E., and were constructed by contract in 1897 by Floyd D. Sherrill under the direction of Mr. Musson. The population served is estimated at about 300, as several families outside of the village limits obtain their supply from the village source. The average daily consumption of water is not known, as there are no meters of any description used on the system. The water is distributed by gravity with an average pressure of about 90 pounds per square inch, through two miles of cast-iron mains, ranging in size from 6 to 8 inches in diameter. There are about 125 taps, of which none are metered.

The investigation was made by Mr. E. S. Chase, assistant engineer in this Department, accompanied and aided by Dr. F. L. Winsor, health officer of Laurens. This investigation was made in carrying out the policy of this Department of making voluntary inspection of the water supplies of this State.

The water supply is obtained by developing several springs in the hills about one mile southeast of the village. These springs are piped to a central distributing reservoir, from which the water is distributed directly to the village. There are two sets of springs developed in adjacent tracts of land on the hill. These springs are of approximately the same area and are excavated shallow basins in the ground, lined with loose stone and connected with central collecting chambers by small iron pipes. The collecting chambers are of concrete and covered, and from these the water is piped to the distributing reservoir. The pipes leading from the springs have their intake ends covered with perforated tin strainers, the holes of which are about ⅛ inch in diameter. Several acres of land surrounding these springs are owned by the village and one set of springs is fenced off from the surrounding properties. The distributing reservoir is approximately 30 feet wide, 100 feet long and 10 feet deep, holding about 150,000 gallons. The reservoir is cleaned once a year and the water mains in the village are flushed about once a month in the summer.

The area of the surface watershed is only about 0.2 of a square mile and there are no houses or dwellings of any sort on this area. The soil is gravel and loam overlaying sandstones and shale. A small part of the area is covered with second growth timber, another small part is covered with pine trees which are being cut off, and the rest of the area is cleared pasture land. The area wooded may be possibly ⅓ of the total area. The slopes are very steep.

There seems to be but one source of pollution and that is from surface wash from the pasture land reaching the springs during rainfall. The springs have absolutely no protection from surface wash. The prevention of such pollution could easily be secured by building concrete walls around each spring, the side walls projecting at least one foot above the surface of the surrounding ground. Ditches could also be dug above each spring, so as to divert direct storm water drainage. Prevention of accidental or wilful pollution could be obtained by providing each spring with tight covers, these covers being kept locked. Further protection could also be obtained by a thorough fencing off of the land owned by the village from the surrounding pasture land.

At the time of the inspection a sample of water was taken from a tap in the village, and the results of the analysis of which, together with other analyses made in the past by the State Hygienic Laboratory, will be found in the appended table. These analyses indicate a water practically clear and colorless, very soft, and on the whole physically suitable for a public water supply. The figures for nitrogen in its various forms are also low. The figures for oxygen consumed are somewhat high, which may be accounted for by seepage of the surface water from the surrounding pastures. The chlorine figures are also about 2 or 3 times as high as normal through this region, and also may be accounted for by the drainage from the pastures. As a rule the bacteriological results are somewhat unsatisfactory, the total counts being higher than are considered desirable in ground water supplies and the occasional presence of organisms of the B. coli type in quantities as small as 1/10 c. c. indicates the presence of active contamination. From a consideration of the sources of these springs it seems almost certain that this active contamination is of animal rather than human origin, although there is still a possibility of accidental or wilful contamination from human sources.

From a consideration of the foregoing facts it is evident that the public water supply of Laurens is capable of being protected to such an extent as to give water of excellent quality. It is evident that the contamination shown in the past by the analyses, as given in the table, has been due largely to wash from pasture lands and that by proper precautions this wash can be nearly, if not wholly, excluded from the springs.

In view of the above conclusions, I would recommend that the village improve the water supply by constructing concrete basins around each spring along the lines indicated previously in this report, by drainage ditches above the springs, and by adequately fencing off the land upon which they are located.

ALBANY, N. Y., *May* 15, 1914

ANALYTICAL DATA OF WATER SUPPLIES

Abbreviations used to describe odors of water: 0, none; 1, very faint; 2, faint; 3, distinct; 4, decided; 5, strong; 6, very strong; a, aromatic; d, disagreeable; e, earthy; f, fishy; g, grassy; m, musty; v, vegetable

Municipality	County	Source	Date of collection	PHYSICAL				CHEMICAL (PARTS PER MILLION)											BACTERIOLOGICAL			
						ODOR		SOLIDS			NITROGEN AS —						HARDNESS			B. COLI TYPE + = PRESENT — = ABSENT		
				Color	Turbidity	Cold	Hot	Total	Loss on ignition	Mineral residue	Free ammonia	Albuminoid ammonia	Nitrites	Nitrates	Oxygen consumed	Chlorine	Total	Alkalinity	Bacteria per c.c.	10 c.c.	1 c.c.	1-10 c.c.
Laurens	Otsego	Tap, public supply	2/14/11	Tr.	Cl.	....	....	41	8	33	.004	.040	.002	0.10	1.10	1.37	16.9	13.0	....	......	......	......
Laurens	Otsego	Tap, public supply	5/ 2/11	5	Tr.	....	....	30	8	22	.064	.050	.002	0.06	0.30	2.12	14.3	10.0	130	+	+	—
Laurens	Otsego	Tap, public supply	6/19/11	10	5	....	....	47	18	29	.008	.030	.001	0.02	2.30	0.50	19.5	12.0	300	+	+	—
Laurens	Otsego	Tap, public supply	9/ 7/11	Tr.	Cl.	....	....	66	6	60	.010	.036	.001	0.20	0.10	1.50	40.3	24.0	1,700	+	+	+
Laurens	Otsego	Tap, public supply	10/13/11	Tr.	Cl.	....	....	57	20	37	.004	.032	.001	0.20	0.30	1.00	31.2	27.0	9,400	+	+	—
Laurens	Otsego	Tap, public supply	11/25/11	Tr.	Cl.	....	....	54	20	34	.010	.042	.004	0.10	0.40	0.25	18.2	16.0	180	+	—	—
Laurens	Otsego	Tap, public supply	12/21/11	Tr.	Cl.	....	....	59	18	41	.008	.032	Tr.	0.20	0.50	1.00	14.3	13.0	150	+	+	—
Laurens	Otsego	Tap, public supply	3/16/12	Tr.	Cl.	....	....	37	12	25	.012	.030	Tr.	0.24	0.50	0.75	16.9	10.0	400	—	—	—
Laurens	Otsego	Tap, public supply	4/ 9/12	1	1	....	....	49	13	36	.004	.020	Tr.	0.12	0.80	1.00	11.8	8.0	900	+	+	+
Laurens	Otsego	Tap, public supply	10/25/12	Tr.	Tr.	....	....	40	4	36	.010	.022	.001	0.16	0.20	0.75	24.7	21.0	500	—	—	—
Laurens	Otsego	Tap, public supply	1/ 2/13	5	Cl.	1 v.	1 v.	29	—	—	.018	.036	Tr.	0.10	0.80	0.25	16.9	14.0	130	—	—	—
Laurens	Otsego	Tap, public supply	4/11/13	Tr.	Tr.	1 v.	1 v.	26	10	16	.002	.010	.001	0.08	1.20	1.00	12.7	10.0	100	—	—	—
Laurens	Otsego	Tap, public supply	6/10/13	Tr.	Tr.	1 v.	1 v.	34	—	—	.006	.012	Tr.	0.06	0.40	0.75	14.3	12.0	*3,000	2+1—	0+3—	0+3—
Laurens	Otsego	Tap, public supply	9/25/13	3	3	2 v.	2 a.	65	—	—	.004	.052	.002	0.06	0.30	1.00	31.2	30.0	300	3+0—	3+0—	1+2—
Laurens	Otsego	Tap, public supply	4/29/14	Tr.	1	1 v.	1 v.	24	8	16	.016	.028	Tr.	0.08	1.10	1.00	14.3	8.0	160	0+3—	0+3—	0+3—

* More than 24 hours in transit.

Copies of the above report were transmitted to the local board of trustees and to Dr. F. L. Winsor, health officer.

MADISON

An inspection of the public water supply of Madison was made on August 7, 1914.

Madison is an incorporated village of about 300 inhabitants located in the eastern part of Madison county, one mile from the Solsville station of the Utica branch of the New York, Ontario & Western R. R. and about 20 miles southwest of the city of Utica. The village has no sewer system but is served by outside closets and one or two cesspools.

The public water supply has until recently consisted of four cisterns located in the village supplied from springs in the hills. This past summer a new supply has been obtained by developing a flowing spring on the west shore of Little lake, about one-half mile north of the village center. The new water system consists of a small pump house, 1½ miles of cast-iron mains, ranging in size from 4 to 8 inches in diameter, and a steel standpipe located on a hill just south of the village. It is expected that the entire population of the village will be served by this new supply, although at the time of the inspection this new supply was not in use, as the pumping machinery has not been installed.

The source of the supply, the flowing spring, has been developed by constructing around it a concrete well about 15 feet square and 10 feet deep supported on 3-inch piling. The spring water will enter through holes in the sheet piling under the west wall, the general direction of the flow of water being from the west. Under ordinary conditions the water in the well will stand at an elevation of 2 feet above the level of Little lake. The concrete walls of the well extend above the surface of the adjacent ground and surface wash would not enter the well under ordinary conditions.

An automatic, electrically driven pump will be placed in the pump house over the spring and this pump will discharge directly into the village mains, any excess being received in the standpipe. This standpipe is 20 feet in diameter, 20 feet high, uncovered, and has an estimated capacity of about 45,000 gallons. It is expected that the water pressure in the village will be 55 pounds per square inch.

The inspection of this supply was made by Mr. E. S. Chase, assistant engineer in this Department, following a request from Dr. A. J. Forward, health officer of the village, and on this inspection the assistant engineer was accompanied and aided by Dr. Forward.

The surface drainage area in the vicinity of the spring and pond is probably a glacial sink hole. The spring is located at the foot of the steep bank of this natural depression. The soil is sand and gravel and the surface area is used to a certain extent for grazing purposes. About one-half mile west of the spring is Madison lake, at an elevation somewhat higher than that of the spring. It has been stated that Madison lake contributes to the underground source from which the water works spring receives its supply. This theory seems very plausible, although there is little evidence to support it. There are no dwellings on the surface watershed, but there is a highway at the top of the bank about 200 feet distant, and the nearest house although off the surface watershed is about 300 feet away. The village itself, which is one-half mile south of the spring, may have some influence upon the character of the ground water. On the whole it would seem that the conditions around the spring are such as to bring about little or no contamination of the underground waters. Under some conditions of pumping a small amount of lake water (Little lake) might reach the well, but the character of the lake water itself is probably fairly good from a sanitary viewpoint, so that little if any contamination would reach the public supply from this source.

It was stated by the health officer that it had been planned in some cases to use abandoned deep wells in the village for cesspools as soon as the public water supply was put into operation. It is conceivable that under certain conditions of ground water flow this use of abandoned wells for sewage disposal would be attended by actual danger to the village water supply.

Samples of water from the spring, Little lake and Madison lake were collected by Dr. Forward on September 28, 1914, and the results of the analyses of which, made by the Division of Laboratories and Research, are given in the accompanying table.

These analyses show that the water of Little lake resembles very closely that from the spring on its shore, thus indicating that this lake is largely spring fed. The water of Madison lake is quite different from the spring water and it would, therefore, seem that either this lake does not constitute the source of the spring or its water is markedly changed by passage through the soil.

The analysis of the spring water shows a water clear and colorless, very hard but otherwise suitable for a public supply from a physical standpoint. With the exception of the nitrates the figures for nitrogen in its various forms are fairly low. The moderately high nitrates taken in conjunction with the chlorine figure, which is eight to nine times that normal in this region, would indicate the occurrence in the past of a certain amount of animal contamination. The probable sources of this past contamination are the village of Madison itself and the pasture land adjacent to the spring. The distance and depth of soil through which contaminated water from the village would have to pass before reaching the spring is such as to probably prevent any active contamination from this source reaching the spring. Although active contamination is shown by the bacterial results it should be noted that workmen had recently been in and around the spring house and that bacterial results obtained under the conditions existing during construction work cannot be considered representative of normal conditions. However, these results do not show any large amount of active contamination and it seems reasonable to assume that this contamination will disappear after the water works are put into regular operation, and if certain precautions, to be outlined below, are carried out.

In view of the above facts the following conclusions may be drawn:

1. That there seems to be no reason to expect the spring to furnish other than a satisfactory and safe public water supply for the village if certain precautions outlined below are carried out.
2. That a certain amount of contamination of the water supply, when first delivered to the village, may occur from dirt and other foreign matters which may have been left in the spring-well, mains and standpipe.
3. That the use of abandoned wells in the village for sewage disposal is a potential danger to the purity of the underground source of water supply in that region.
4. That, unless the standpipe is covered so as to exclude light, there is every possibility of growths of algae which might give rise to unpleasant tastes and odors in the water supply.

In consideration of the above conclusions I beg to submit the following recommendations:

1. That before the water supply is put into permanent service the village authorities thoroughly clean the spring-well and standpipe and thoroughly flush the water mains.
2. That all precautions should be taken, by means of adequate drainage ditches, to prevent surface wash from reaching the springs.
3. That the village authorities, by local ordinances, should prohibit the use of abandoned wells for sewage disposal.
4. That the standpipe should be covered in order to prevent algae growths.

ALBANY, N. Y., *October* 23, 1914

REPORT OF WATER ANALYSIS FOR MADISON

Laboratory No.				
Source		Spring at Little Lake	Little Lake	Madison Lake
Collected on		9/28 14	9/28/14	9/28/14
Color		trace	trace	5
Turbidity		clear	clear	2
Odor, cold		1 v.	1 v.	1 a.
Odor, hot		1 v.	1 v.	1 a.
Solids, total		294	258	125
Loss on ignition		52	31	30
Mineral residue		242	227	95
Ammonia, free		.004	.002	.004
Ammonia, albuminoid		.012	.008	.130
Nitrites		.002	.002	trace
Nitrates		0.60	0.90	trace
Oxygen consumed		0.70	0.45	4.25
Chlorine		3.63	4.38	0.88
Hardness, total		235.5	221.5	91.4
Alkalinity		211.0	218.0	87.0
Bacteria per c.c		180	120	60
B. coli type	10 c.c.	2+1—	3+1—	1+2—
	1 c.cc.	0+3—	0+3—	0+3—
	1/10 c.c.	0+3—	0+3—	0+3—

Results are expressed in parts per million. + Present. — Absent.

Abbreviations used to describe odors of water: 0, none; 1, very faint; 2, faint; 3, distinct; 4, decided; 5, strong; 6, very strong; a, aromatic; d, disagreeable; e, earthy; f, fishy; g, grassy; m, musty; v, vegetable.

Copies of the above report were transmitted to the local Board of Trustees and to Dr. A. J. Forward, health officer.

NEWBURGH

An investigation of the public water supply of the city of Newburgh was made on November 19, 1914.

Newburgh is a city of about 30,000 inhabitants, located in the northeastern part of Orange county, on the west bank of the Hudson river, 60 miles north of New York city. It is on the Hudson River division of the West Shore R. R. and is also the terminus of the Newburgh branch of the Erie R. R.

A special sanitary investigation of this city was made by Prof. H. N. Ogden in 1908 and the report of his investigation is published in the twenty-ninth annual report of this Department, page 768. The water supply of the city is dealt with at some length in this former report.

The water supply of Newburgh has been derived from Washington lake, three miles west of the city, since 1853. This lake is fed by two small brooks, known as Silver stream and Patton brook. At various times since the installation of the water works improvements and additions have been made to the system. These have included the construction of a high service reservoir and pumping station in the city, the raising of the dams at the lake, the laying of additional mains from the lake to the city and the installation of a hypochlorite sterilization plant. In 1912 the dams were last raised about 5 feet and in the same year a new 30-inch pipe line was laid to the city. The hypochlorite plant was installed and put in operation during the early part of the present year. The water works are owned and operated by the city under the direction of the Board of Water Commissioners, of which Mr. Thomas King is president and Mr. Curtis Stanton, superintendent.

Practically the entire population of the city is served by the public water supply. The average daily water consumption is somewhat over 4,500,000 gallons, the maximum during 1914 being 500,000 gallons and the minimum

4,400,000 gallons. Of this consumption a considerable proportion is probably used for industrial purposes, although, as there are only 4 or 5 meters on service taps, no definite data are available. There are 43 miles of water mains ranging in size from 4 to 30 inches in diameter, and 4745 service taps. About two-thirds of the consumption is distributed by gravity directly from Washington lake, while the remaining one-third is distributed by the high service pumping plant which pumps against the head maintained by the high service reservoir. The pressure in the mains varies from 30 pounds per square inch in the hill section of the city to 130 pounds in the low section near the river.

Five or six of the mills and factories have auxiliary supplies for fire protection taken from various sources. Two mills have auxiliary supplies taken from the Hudson river, and while one of these mills has its fire system entirely separate from the city system, the other mill has a check valve between the two systems.

Washington lake is a natural lake whose area and capacity have been increased by low earthen and masonry dams. Its present area when full is 164.3 acres and it has an available storage capacity of approximately 1,000,000,000 gallons. The bottom of the lake is of sand and muck and a large portion of the lake is very shallow. Adjacent to Washington lake is another reservoir known as the Lockwood basin. This basin is formed by an earth and masonry dam and has an area of 15 acres and a capacity of 36,000,000 gallons. A masonry channel feeds the basin from the waste weir of the Washington lake dam.

The intake from Washington lake is a wooden flume 24 inches square in cross section, extending 400 feet into the lake from a brick and concrete gate house on the shore. The end of this intake flume is located about 28 feet below the high water level and about 12 or 15 feet above the bottom of the lake. An old intake which is not now used extends about 200 feet into the lake.

From the lake a 30-inch cast-iron main extends into the city. About a mile east of the lake is located a gate house in which a Venturi meter is installed. In addition to the 30-inch main a 24-inch main extends to this gate house and from it a 20-inch and a 12-inch main to the city. Near this gate house a small storage reservoir formerly existed, but this has been abandoned for some years. The 12-inch main is the original main laid in 1853.

The high service pumps take the water directly from the low service mains and pump into the high service system. At present a 6-inch Alberger centrifugal pump driven by a Westinghouse motor is used for the high pressure pumping. There are also two Worthington steam pumps and a 100 h. p. boiler at this station but their use has been abandoned and they are held in readiness for emergency use only. The high service reservoir is an open masonry structure located in the northern part of the city and has a capacity of approximately 1,000,000 gallons.

At Washington lake there is a brick and concrete pumping station containing two 10-inch centrifugal pumps and a 100 h. p. steam boiler. In times of extreme low water the suction lines from these pumps can be extended to the deepest part of the lake and water can thus be pumped into the gravity mains of the city. This pumping equipment has been used only once or twice in the history of the water works.

There are in all 7 laborers, 1 engineer, 2 patrolmen at Washington lake and 1 assistant superintendent employed, besides the superintendent. Daily patrol of the shores of Washington lake is made as well as several inspections of the watershed during the year. The high service reservoir is cleaned every year in May and the water mains are flushed three or four times during the summer.

Silver stream is diverted by a small dam across its natural course, into an open, masonry lined channel leading into the western end of Washington lake. The diversion dam is about 2,000 feet southwest of the lake. Patton brook is also diverted from its natural course through about 1,800 feet of open conduit and enters at the northern shore of the lake. The watersheds of these two streams are adjacent and may be considered as one.

The total area of the watershed tributary to Silver stream, Patton brook, Washington lake, and Lockwood basin is 6.8 square miles. In all there are about 50 dwellings with accompanying barns and outbuildings. The population may be estimated at 200, or about 30 per square mile. The topography is gently rolling and the slopes are moderate. Practically the entire area is cleared land devoted to farming. The soil is largely clay and after rainfall considerable turbidity is carried into the water supply. There are also several swamps on the watershed. Between 200 and 300 acres of the watershed are owned by the city.

Since April 19, 1914, the water derived from Washington lake has been treated with hypochlorite of lime. The plant for this treatment is located in a wooden house at Washington lake and the hypochlorite solution is discharged into the 30-inch main leading from the lake. This plant was designed by Hazen & Whipple, consulting engineers.

The plant consists of a concrete solution tank divided into two independent compartments, each of which is 6 feet 6 inches wide, 6 feet 9 inches long and 4 feet 6 inches average depth, with a capacity of about 1,300 gallons. A small portion of each compartment is partitioned off and serves as a mixing box for the bleach. The bottom of this mixing box is a grid provided with ½-inch holes. When the solution tank is full or nearly full of water, bleach placed in the mixing box is thoroughly stirred by a screw operated by an Evinrude gasoline motor. The mixing box is so arranged that a thorough mixing and circulation of the bleach solution is obtained. A blow-off valve for cleaning is provided at the bottom of each compartment.

A system of valves and piping connects the compartments of the solution tank with two concrete orifice boxes. This system is so arranged that either compartment or either orifice box may be used. The orifice boxes are 12 inches wide, 36 inches long and 30 inches deep. In the bottom of each is a calibrated orifice upon which a constant head is maintained by means of a glass float operating a slide valve in the inlet pipe from the solution tank. From the orifice the solution flows into a lead pipe, through which it is discharged into the 30-inch conduit to the city.

The amount of bleach applied may be varied by adjusting the head on the discharge orifice, by using orifices of different size, or by using greater or less amounts of bleach. During the day from 6 A. M. to 6 P. M. about twice as much bleach is applied as during the night. This variation is accomplished by the use of a smaller orifice at night than during the day. About 57 pounds of bleach are added each 24 hours and estimating an average daily consumption of 4,500,000 gallons and 33 per cent. available chlorine in the bleach, the average rate of application would be 0.50 parts of available chlorine. A sample of the bleach solution was taken at the time of the inspection and upon analysis by the Division of Laboratories and Research was found to contain 0.17 per cent. available chlorine. With 1,300 gallons of this strength solution applied to 4,500,000 gallons of water the rate of application would be 0.49 parts per million of available chlorine. Some complaints have been made by consumers of the water as to tastes attributed to the bleach.

Weekly bacterial analyses of the treated water are made by Nicholas S. Hill, Jr., of New York, and in 1913 and 1914 sanitary inspections of the watershed were made under his direction.

The following table gives the results of recent analyses of the treated water made by Mr. Hill:

1914	Count on Agar at 37° C. per c.c	B. Coli Absent in
Oct. 19	16	10 c.c.
Oct. 31	3	10 c.c.
Nov. 7	16	10 c.c.
Nov. 16	9	10 c.c.

Rules and regulations for the protection from contamination of this water supply were enacted by this Department July 27, 1893, and their provisions are apparently being enforced by the local authorities. No trespassing is allowed on any of the property owned by the city, nor fishing, boating, bathing or ice cutting on the reservoirs.

The inspection was made by Mr. E. S. Chase, assistant engineer in this Department, following a request from the Board of Water Commissioners for advice relative to the proper manner of removal of fish from Washington lake. The assistant engineer was accompanied and aided on this inspection by Mr. Thomas King, president of the Board of Water Commissioners, and by Mr. Curtis Stanton, superintendent.

On account of a severe snow storm the conditions upon the watershed were somewhat obscured and due to lack of time the entire watershed was not covered. The portion covered, however, is representative of the total area. With one exception the various houses and buildings seem to be well distant from any stream tributary to Washington lake. This exception is the Brown farm, about one-half mile west of the Silver stream basin. At this place the barn and other structures are located comparatively close to the stream. As the house is fairly far away from the stream the chief contamination reaching the brook would be of animal origin.

Numerous highways traverse the watershed and at several points cross or pass close to the water supply streams, consequently there exists opportunity for a certain amount of contamination by road wash. Further contamination may and undoubtedly does occur from surface wash from cultivated fields and pasture lands. Although the chief contamination is probably from animal sources the comparatively large population on the watershed and the several highways indicate the possibility of chance or wilful contamination of human origin.

The chief reason for which it was desired to remove the fish from the lake was the occurrence at times of "fishy" tastes and odors in the water supply. As no fish had been removed from the lake for 15 or 16 years it was assumed that the tastes and odors were due to the large number of fish which had presumably accumulated. On the day of the inspection several employes of the water works were engaged in seining for the fish and this work which had been begun on the day previous had resulted in the removal of perhaps 200 lbs. of fish.

Considering the physical conditions at this lake, the large amount of organic matter present in the water and in the muck at the bottom of the reservoir, and also the fact that algae have been present in the past it would seem more reasonable to attribute such tastes and odors to growths of algae rather than to fish. Therefore, in order to determine the presence or absence of algae. a sample of the lake water was collected at the time of the inspection. This sample when examined microscopically showed the presence of these organisms in considerable numbers, in fact there were so numerous that small bits of filaments were visible in the water without the aid of the microscope.

While no attempt was made to determine the quantitative occurrence of these organisms, the qualitative examination showed the presence of the following types: Anabaena, asterionella, coelastrum, melosira and synedra, and in addition to these algae a few crustacea and protozoa. Of these organisms anabaena produces the most unpleasant tastes and odors in water especially when the organism is decomposing. The organisms in the sample examined, however, were in good condition and no particular odor was noticed. Asterionella in large quantities also produces disagreeable tastes and odors. The other types, unless occurring in extraordinary numbers, cause comparatively little trouble.

The results of the analyses of samples collected at the time of the inspection together with others made in the past by the Division of Laboratories and Research may be found in the appended table.

While the past analyses cannot indicate the present bacterial quality of the water supplied to the city on account of the present practice of sterlization, they do show the physical and chemical quality of the water and the bacterial quality without treatment. These analyses show a water with considerable color, usually slightly and frequently highly turbid, often with distinct odors indicative of algae growths, and with moderately high hardness. The figures for free and albuminoid ammonia indicate considerable nitrogenous organic matter both decomposing and undecomposed and the nitrites and nitrates show the effect of a marked amount of past and recently past pollution. The figures for oxygen consumed are high as would be expected from the presence of considerable swampy area on the watershed. The chlorine content varies from two to three times that found in unpolluted water of this region. The bacteriological results show high total numbers of bacteria and the frequent occurrence of organisms of the B. coli type in 1 c.c. samples of water and occasionally in samples as small as 1/10 c.c.

The analyses of the samples taken on the day of the inspection show high numbers of bacteria in the water from Silver stream and B. coli present in sample 1/10 c. c. in volume. This indicates the occurrence of considerable contamination of animal origin. The sample from Washington lake shows somewhat less contamination due probably to the beneficial effects of storage, although conditions at the lake were hardly normal due to the stirring up of the lake by the seining operations. The single sample of water after the hypochlorite treatment shows plainly the beneficial results of sterilization. This is corroborated by the results of the analyses made by the expert retained by the city.

On account of the high and variable organic matter in this water it is somewhat difficult to use constantly a small amount of bleach and obtain efficient sterilization at all times. In case regular analytical determinations of organic matter were made coincident with the bacterial examinations it might be possible to proportion the application of the hypochlorite according to the organic content of the water. Such a proportioning might prevent any tastes of the bleach in the treated water and at the same time maintain the efficacy of the treatment.

In view of the above facts the following conclusions may be drawn:

1. That the sanitary conditions on the watershed tributary to the public water supply of Newburgh are characteristic of an area with so large a resident population.
2. That while there are apparently few, if any, permanent sources of direct contamination, there exists, as is true of all surface supplies derived from a populated watershed, opportunity for contamination of an accidental, incidental or wilful nature.
3. That the possibility of such contamination becoming serious is somewhat lessened by the large storage capacity of Washington lake and is further minimized by the sterilization of the water.
4. That the efficiency of sterilization will depend upon the care with which the hypochlorite plant is operated; and considering the character of the water, and the fact that the hypochlorite, is not applied exactly in proportion to the rate of flow of the water, it would be unwise to reduce the amount of bleach added notwithstanding the fact that some taste is occasionally imparted by it to the water.
5. That the "fishy" tastes and odors noticed in the water are undoubtedly due to growths of algae which at times occur in large quantities and that such tastes and odors are not due to the presence of fish.
6. That such tastes and odors affect only the esthetic and physical character of the water and do not affect its sanitary quality.
7. That the growths of such algae might be checked and controlled by the judicious use of copper sulphate.
8. That a certain amount of danger of contamination of the water in the distribution system may exist due to the auxiliary mill supplies from the Hudson river and other polluted sources, providing the valves between the two systems are not tight and providing the pressure is greater in the mill systems than in the village system.

I would therefore recommend:

1. That the Board of Water Commissioners continue their careful oversight of the sanitary conditions of the watershed and in case any sources of contamination may be found to exist that they continue their vigorous policy of abating and removing such conditions.

2. That the present rate of application of hypochlorite to the water be maintained unless a thorough study by an expert shall determine that a reduced rate can be used with safety and in that event particular attention should be given to the varying organic quality of the water in proportioning the rates of chlorination.

3. That in order to check and control the algae growths which give rise to tastes and odors, the question of the application of copper sulphate to the reservoir be carefully considered and that such treatment be carried out only under expert supervision.

4. That if it be found impossible or undesirable to improve the esthetic quality of the water by the means described above, it would then be advisable to consider some permanent means of improving the supply such as filtration and aeration.

5. That a careful study be made of the condition of the valves separating the auxiliary mill supplies from the city distribution system in order to determine and prevent any contamination of the city supply which may occur from such sources.

ALBANY, N. Y., *December* 16, 1914

RESULTS OF WATER ANALYSES

Abbreviations used to describe odors of water: 0, none; 1, very faint; 2, faint; 3, distinct; 4, decided; 5, strong; 6, very strong; a, aromatic; d, disagreeable; e, earthy; f, fishy; g, grassy; m, musty; v, vegetable

Municipality	County	Source of samples	Date of collection	PHYSICAL				CHEMICAL (PARTS PER MILLION)											BACTERIOLOGICAL			
						ODOR		SOLIDS			NITROGEN AS —						HARDNESS			B. COLI TYPE + = PRESENT — = ABSENT		
				Color	Turbidity	Cold	Hot	Total	Loss on ignition	Mineral residue	Free ammonia	Albuminoid ammonia	Nitrites	Nitrates	Oxygen consumed	Chlorine	Total	Alkalinity	Bacteria per c.c.	10 c.c.	1 c.c.	1-10 c.c.
Newburgh.....	Orange........	Tap, public supply..........	3/23/09	15	12	....	....	75	22	53	.034	250	.002	0.24	4.95	2.75	45.7	21.5	275	+	—	—
Newburgh.....	Orange........	Tap, public supply..........	6/12/09	12	5	....	....	78	24	54	.004	.212	.001	0.10	4.80	1.75	45.7	30.5	300	+	+	—
Newburgh.....	Orange........	Tap, public supply..........	10/22/09	5	3	....	....	82	21	61	.084	.150	.010	0.30	4.80	2.25	58.4	36.0	750	—	—	—
Newburgh.....	Orange........	Tap, public supply..........	1/ 6/11	25	10	1 v.	1 v.	89	35	54	.018	.152	.010	0.30	4.55	3.00	42.9	39.0	6,500	+	+	—
Newburgh.....	Orange........	Tap, public supply..........	3/24/11	35	12	2 v.	2 v.	91	37	54	.096	.188	.003	0.24	5.60	2.75	35.1	31.0	200	+	—	—
Newburgh.....	Orange........	Tap, public supply..........	5/19/11	15	5	1 v.	1 v.	82	23	59	.022	.174	.002	0.30	4.70	2.25	41.6	30.5	170	+	+	—
Newburgh.....	Orange........	Tap, public supply..........	6/29/11	20	10	1 v.	2 v.	89	32	57	.006	.074	.001	0.40	6.50	1.75	48.6	34.5	200	+	—	—
Newburgh.....	Orange........	Tap, public supply..........	10/20/11	12	5	1 v.	1 v.	100	20	80	.008	.146	.001	0.20	3.65	2.75	55.7	39.0	950	+	+	+
Newburgh.....	Orange........	Tap, public supply..........	1/23/12	15	2	1 v.	1 v.	84	16	62	.020	.128	.003	0.24	1.90	2.12	60.0	36.0	130	+	+	—
Newburgh.....	Orange........	Tap, public supply..........	2/27/12	15	10	1 v.	1 v.	92	32	60	.022	.170	.005	0.40	4.80	3.00	40.3	33.0	8,800	+	+	—
Newburgh.....	Orange........	Tap, public supply..........	4/ 2/12	25	5	2 a.	2 a.	63	13	50	.020	.212	.002	0.48	4.40	2.50	48.6	38.0	400	+	—	—
Newburgh.....	Orange........	Tap, public supply..........	10/ 2/12	20	15	1 a.	1 a.	90	30	60	.012	.242	.001	0.10	5.20	2.25	54.3	38.0	1,400	+	—	—
Newburgh.....	Orange........	Tap, public supply..........	11/ 7/12	35	5	1 v.	1 v.	79	20	59	.108	.260	.005	0.10	5.00	2.25	52.9	41.0	......	+	+	—
Newburgh.....	Orange........	Tap, public supply..........	12/27/12	20	5	....	....	104	17	87	.046	.198	.001	0.14	5.40	2.25	54.3	40.0	130	—	—	—
Newburgh.....	Orange........	Tap, public supply..........	1/27/13	25	25	2 m.	2 m.	94	....	....	.020	.238	.004	0.36	5.70	2.37	50.0	30.0	1,500	2+1—	0+3—	0+3—
Newburgh.....	Orange........	Tap, public supply..........	3/10/13	25	15	3 a.	3 a.	104	....	....	.008	.184	.001	0.26	4.70	2.75	31.4	34.0	325	3+0—	0+3—	0+3—
Newburgh.....	Orange........	Tap, public supply..........	5/26/13	25	5	1 a.	1 a.	85	....	....	.014	.168	.001	0.16	4.90	2.25	41.6	33.0	1,000	3+0—	3+0—	0+3—
Newburgh.....	Orange........	Tap, public supply..........	7/ 7/13	18	3	1 a.	1 a.	90	....	....	.004	.178	.001	0.06	3.40	2.00	47.1	37.0	325	3+0—	1+2—	0+3—
Newburgh.....	Orange........	Silver stream..............	11/19/14	....	....	....	....	....	....	....	....	....	....	....	....	......	......	......	4,600	3+0—	3+0—	2+1—
Newburgh.....	Orange........	Washington lake...........	11/19/14	10	4	1 v.	1 v.	132	55	77	.028	.174	.002	0.08	7.30	2.50	39.0	38.0	120	2+1—	2+1—	1+2—
Newburgh.....	Orange........	Tap, public supply..........	11/19/14	....	....	....	....	....	....	....	....	....	....	....	....	......	......	......	10	0+3—	0+3—	0+3—

Copies of the above report were transmitted to the Board of Water Commissioners, to Dr. T. J. Burke, health officer and to Hon. John E. Van Kennen, conservation commissioner.

ORISKANY FALLS

An investigation of the public water supply of Oriskany Falls was made on April 24, 1914.

Oriskany Falls is an incorporated village of about 1,000 inhabitants located 18 miles southwest of Utica on the Utica division of the N. Y., O. & W. R. R. The chief industries of the village are two or three knitting mills and one or two stone quarries. There is no complete sewer system, although one or two of the main streets have combined storm water and sanitary sewers, which discharge into Oriskany creek. Aside from these sewers there are several private sewers and the rest of the village is served by outside closets and a few cesspools.

The public water supply is owned and operated by the village under the direction of the board of trustees, of which Mr. James C. Douglas is president. The water supply is derived from a spring fed reservoir one and one-half miles southwest of the village. The water works were designed by A. M. Scripture, C. E., and constructed by contract under his direction in 1911, and the system was put into service in the spring of 1913. The estimated population served by this supply is about 600 or 60 per cent of the total population. Distribution takes place by gravity through six miles of cast-iron pipe ranging in size from 6 to 12 inches. There are about 100 service taps, of which only ten are metered. The daily water consumption is unknown, but may be estimated at about 100,000 gallons per day. The water pressure of the village is 75 pounds per square inch. Aside from the municipal supply some of the people are served by private wells and springs. In case of fire, water from Oriskany creek can be pumped directly into the village mains from one of the mills, in order to supplement the regular supply. Under ordinary conditions the creek water does not reach the village mains because the connection is made through a gate valve which is usually kept closed.

The village supply is obtained by impounding water from several springs in a reservoir formed by a dam across a small ravine which was formerly the natural drainage course for these springs. The area covered by the reservoir is about 8 or 10 acres and when the reservoir is filled it has an estimated capacity of 13,000,000 gallons. The dam is a gravity concrete dam about 100 feet long and 20 feet high at the highest point. The subsoil in this vicinity is coarse gravel and as yet the reservoir has not become filled on account of leakage through the soil. Owing to the extreme porosity of the soil and the difficulty of preventing leakage, it was found necessary to puddle with clay the bottom of the reservoir in the vicinity of the dam in order to prevent leakage as much as possible. When the reservoir was constructed, the site was not thoroughly stripped of the surface soil and a considerable quantity of organic matter was left in the bottom of the reservoir. During the past winter at a time when the reservoir was covered with ice, decomposition of the organic matter at the bottom of the reservoir used up the dissolved oxygen present in the water and under anaerobic conditions, gave rise to objectionable tastes and odors.

The inspection was made by Mr. E. S. Chase, assistant engineer in this Department, accompanied and aided by Dr. C. J. Pollard, health officer of the village.

The springs which feed the reservoir issue from an area adjacent to the shores and flow into the reservoir. About 15 or 20 acres of land upon which these springs and the reservoir are located are owned by the village.

The site of the reservoir was originally a marsh and the springs around the edge of the reservoir flow through swampy soil. While the surface watershed area of the springs is about one-quarter of a square mile, all direct surface water from land other than that owned by the village is excluded from the reservoir by ditches, which carry the surface water around the reservoir. A highway passes along one side of the property and is to undergo reconstruction as a State highway this coming summer. This suggests the possible danger of the contamination of the water supply by laborers engaged on the highway work. Although the area around the reservoir is fenced off, and trespassing forbidden, no notices to this effect have been posted.

At the time of the inspection a sample of the water was collected from a tap in the village and the result of the analysis of this sample, together with the result of a previous analysis made by the Division of Laboratories and Research, may be found in the accompanying table. It is impossible to draw definite conclusions as to the quality of the water supply from one or two analyses, but these analyses, taken in conjunction with the data secured by the sanitary inspection, are of considerable value as an indication of the quality of the water. These analyses show a very hard but fairly clear and colorless water. The disagreeable odor noticed in the first sample was undoubtedly due to the decomposition processes described previously, and this decomposition also accounts for the high figures for free ammonia and nitrates in the same sample. The quality of water as shown by the second sample was much better than that of the first, and indicates that the decomposition processes were much less active. In both samples the bacteriological counts are higher than is considered desirable for potable waters, but the absence of organisms of the B. coli type in all three of the 10 c. c. inoculations indicates the freedom of the water from any serious contamination from human or animal sources at the times when the samples were taken.

From the foregoing facts, the following conclusions may be drawn:

1. That from a sanitary standpoint the public water supply of Oriskany Falls is of a fairly safe and satisfactory quality, but under certain conditions brought about by the depletion of the oxygen content in the reservoir water, decomposition of organic matters in the reservoir brings about disagreeable tastes and odors. While these tastes and odors cannot be considered as specifically deleterious to public health, they are decidedly objectionable from an esthetic point of view, and may be prejudicial to health indirectly by bringing about the use of polluted wells at times when the village water is unpleasant to taste.

2. That ordinarily there seems to be little opportunity of dangerous contamination of the water supply, although it is evident that accidental or wilful contamination may affect the quality of the water. Danger of such contamination would be reduced by measures designed to prevent trespassing in the vicinity of the springs and reservoirs.

3. That a serious opportunity of contamination may occur from the use of polluted creek water in supplementing the regular supply at times of fire through the pumping of the creek water into the village mains. The condition of the creek water is such that its mixture with the village supply would be attended by the gravest menace to the public health, and every possible measure should be taken to avoid its use. Only the most extreme need could warrant the introduction of creek water into the village mains, and if such an emergency should ever arise extraordinary precautions should be taken by the village authorities to prevent the possible occurrence of an outbreak of water-borne disease. These precautions should include immediate warning to the inhabitants to boil the water until all danger should be past, and the thorough flushing and disinfection of the water mains as soon as the emergency use of the creek water had been discontinued.

4. That, were the total 13,000,000 gallon capacity of the reservoir available, it would afford a supply sufficiently adequate for ordinary fire purposes, and consequently the possibility of an emergency use of the creek water would be materially lessened.

In view of the above conclusions, I beg to present the following recommendations:

1. That in case of further occurrence of disagreeable tastes and odors the village authorities consider the adaptability of the following remedial measures:

(a) The removal of organic deposits from the bottom and sides of the reservoir;

(b) The covering of pockets of organic deposits with clean gravel;

(c) The aeration and filtration of the water.

2. That in order to reduce the danger of wilful or accidental pollution of the water supply to a minimum, notices be posted prohibiting trespassing and, during the highway construction in the vicinity, the village maintain a patrol of the water supply.

3. That, in order to reduce to a minimum the possibility of the use of the creek water as a supplementary supply the village should put the reservoir into the best possible condition to maintain its maximum storage capacity. In case it should be found impossible to bring about this improvement the village should consider the installation of separate fire mains from the auxiliary pump to strategic points for fire protection. As previously pointed out, only in case of dire emergency should the polluted creek water enter the village mains and should such an emergency occur, the extraordinary precautions as outlined before should be carefully carried out.

LBANY, N. Y., *May* 26, 1914

REPORT OF WATER ANALYSIS FOR ORISKANY FALLS

boratory No.			
urce		Tap	Public supply
llected on		3/19/14	4/24/14
lor		5	5
rbidity		1	1
lor, cold		3 d.	1 v.
lor, hot		3 d.	1 v.
lids, total		342	231
ss on ignition		57	21
ineral residue		285	210
mmonia, free		.284	.018
mmonia, albuminoid		.078	.046
trites		.075	.007
trates		0.16	.070
ygen consumed		2.40	1.90
lorine		2.27	2.00
rdness, total		243	201.5
kalinity		233	191.0
cteria per c.c.		700	850
coli type	10 c.c.	0+3—	0+3—
	1 c.c.	0+3—	0+3—
	1/10 c.c.	0+3—	0+3—

Results are expressed in parts per million. + Present. — Absent.
Abbreviations used to describe odors of water: 0, none; 1, very faint; 2, faint; 3, distinct; 4, ided; 5, strong; 6, very strong; a, aromatic; d, disagreeable; e, earthy; f, fishy; g, grassy; m, sty; v, vegetable.

Copies of the above report were transmitted to the board of trustees of the llage and to Dr. G. V. Pollard, health officer.

OSSINING

An investigation of the public water supply of the village of Ossining, estchester county, was made on June 2, 1914.

Ossining is an incorporated village of about 12,000 inhabitants located on e east bank of the Hudson river, 33 miles north of New York city on the ain line of the N. Y. C. & H. R. R. R. The village has just completed a mprehensive sewer system discharging into the Hudson river.

The water supply is derived from Indian brook about 2 miles north of the llage. The waterworks were designed by Knight & Hopkins, civil engineers, d constructed by contract under their supervision in 1888. In 1909 a new high service tower and high service pumping station were constructed. In the same year the dam at Indian brook was raised, increasing the capacity of the reservoir 30,000,000 gallons. In the latter part of 1913 a 16-inch connection was made with the Croton aqueduct in order to have possible an auxiliary supply in case of need. An apparatus for treating the water with liquid chlorine was also installed in December, 1913. The waterworks are owned by the village and are under the control of the board of water commissioners, of which Dr. E. B. Sherwood is president and Mr. James Bedell superintendent.

Practically the entire population of the village is served by the public supply and the daily water consumption is about 700,000 gallons. The water is distributed by pumping through 24 miles of cast-iron mains ranging in size from 3 to 16 inches in diameter. The pressure in the village varies from 40 to 140 pounds per square inch according to the elevation, as the village is built on a steep side hill. There are in all 1,733 service taps, of which 1,526 are metered. While it is now possible to obtain Croton water from the aqueduct of New York city no auxiliary supply has been used in the past.

The supply is developed by impounding Indian brook in a storage reservoir formed by an earthen dam with masonry core wall. From this reservoir the water flows by gravity to the pumping station located near the mouth of Croton river, ½ mile distant. The pumping station delivers the water directly to the village, any excess pumped over consumption being stored in the intermediate reservoir located east of the village about 2¼ miles southeast of the pumping station. For distribution above the level of the intermediate reservoir the water is pumped to the two high service standpipes. The high service pumping station is in the northeastern part of the village. The older of the two standpipes is located on a hill just east of the village and the other is on high ground about 1 mile northeast of the village.

The Indian Brook reservoir has three intakes, each a 16-inch pipe, at different levels, the lowest being about 3 feet from the bottom and 50 feet from high water mark. The intermediate reservoir has the water entering and leaving by the same 16-inch pipe at about the center of the reservoir and 4 feet above the bottom.

The Indian Brook (low service) pumping station is a brick building 30 feet x 80 feet containing the pumping equipment, which consists of one Loretz pump with a capacity of 2,000,000 gallons daily and one Deane pump with a capacity of 1,000,000 gallons daily, the latter pump being used as an auxiliary pump in times of emergency only. Pumping is done against a static head of about 310 feet while the total pumping head is about 180 pounds. The high service station is a concrete building 18 feet x 25 feet and contains two electrically driven Rumsey triplex pumps with a daily capacity of 100,000 gallons and 200,000 gallons respectively. The low service pump is operated about 12 hours daily and the high service pumps 1 hour and 4 hours respectively; the smaller being operated 4 hours.

The Indian Brook reservoir covers approximately 25 acres, has a maximum depth of 29 feet and a capacity of 130,000,000 gallons. The bottom is lined with puddled clay and the side slopes are lined with stone. Its elevation is 188 feet above sea level. The intermediate reservoir is about 3 or 4 acres in area, surrounded by low earthen banks, with the inside slopes stone lined and the bottom puddled with clay. The depth of this reservoir is about 12 feet and it has an estimated capacity of 17,000,000 gallons. The older of the high service towers is of iron surrounded by brick, covered, and with a capacity of 100,000 gallons. The new tower is of concrete, surrounded by stone masonry, covered, and with a capacity of 200,000 gallons.

In addition to the superintendent there are 10 men employed regularly on the water works, namely, 1 bookkeeper, 2 engineers, 1 fireman, 1 man to look after electric pumps, 4 laborers and 1 foreman. The laborers take care of the reservoirs, make house connections, and perform the other necessary duties in connection with the maintenance of the waterworks. The reservoirs are not cleaned out except by blowing off the bottom water in the spring through the mud pipes. The water mains are flushed about once a month and certain dead ends are flushed once a week.

Since December, 1913, an apparatus for treating the water with liquid chlorine has been in service at the Indian Brook pumping station. At first difficulty was experienced in getting the chlorine into the water on account of the necessity of forcing it into the main against a pressure of about 180 pounds per square inch. It was not until the middle of March, 1914, that this difficulty was overcome and since then the chlorine is said to have been successfully applied with satisfactory results. The apparatus used is manufactured by the Electro-Bleaching Gas Co. of New York and may be described as follows:

A steel cylinder containing liquid chlorine under an initial pressure of about 100 pounds per square inch is connected through two pressure reducing valves to an empirically calibrated orifice which in turn discharges at the bottom of an absorption tower filled with ½-inch cubes of pumice stone. At the top of this tower, which is about 8 feet high and 6 inches in diameter, a small stream of water enters and trickles down over the pumice stone. The descending water meets and dissolves the ascending gas. The resulting concentrated solution of chlorine collects at the bottom of the tower and then flows to a small high pressure pump, operated by a water motor, which forces the solution into the discharge main leading from the water supply pump. It has been found necessary to construct the cylinder and piston of the pressure pump of hard rubber and to make connections with rubber hose because the corrosiveness of the chlorine renders the use of metal impossible. The apparatus is provided with two gauges, one to determine the pressure in the cylinder of chlorine and thus indicate when the chlorine has become exhausted; the other to show the rate of chlorine discharge in ounces per hour. At the time of the inspection chlorine was being added at the rate of 3.9 pounds to 700,000 gallons of water or 0.59 p. p. m. of chlorine. Weekly analyses of the treated water are made by Nicholas S. Hill of New York city.

The inspection of the water supply was made by Mr. E. S. Chase, assistant engineer in this Department, accompanied by Mr. James Bedell, superintendent of the waterworks.

The intermediate reservoir, while receiving practically nothing but water pumped from the Indian Brook reservoir, also receives a small amount from a brook which enters it at one end. This brook, which is dry in summer, has a drainage area of about ⅕ of a square mile. Upon this area there is but one house located about 300 feet from the reservoir. This house is provided with inside plumbing which is connected with a sewer in a highway off the watershed. With this exception there are no other houses on the watershed directly tributary to the intermediate reservoir.

The watershed contributory to the Indian Brook reservoir is 1.33 square miles in area. The greater part of this watershed consists of hills, well-wooded but about 1/10 of a square mile near the head of the brook is a low swampy area with peaty soil. A highway follows in a general way the direction of the brook and along this highway there are scattered 12 occupied houses, 1 schoolhouse and 1 church. None of these houses are very near the stream and at three or four of them the privies are provided with removable containers. The total population on the watershed may be estimated at 60 or about 45 per square mile.

The water supply is protected from contamination by rules and regulations enacted by this Department, December 4, 1894. The watershed is inspected once a week by a watchman who looks after the reservoir and who lives near by. Measures have been taken in the past to remove sources of contamination by purchasing properties, removing privies, etc. At one farm where there existed opportunity for pollution of a small intermittent tributary to Indian brook this tributary has been carried through the barnyard and adjacent land in two or three hundred feet of cast-iron pipe. At this same farm the privy has been removed to a safe distance from the small stream and provided with a removable container.

At times trouble has been experienced with tastes and odors in the water due to algae and in order to obviate this trouble the reservoirs are dosed with copper sulphate whenever algae occur. This occurs usually in the spring and fall and one application of copper sulphate in the proportion of one part per million is sufficient to prevent serious growth of algae. The effect of the chlorination of the water upon the tastes and odors from the algae has not been determined.

The results of analyses of samples of water made in the past by the Division of Laboratories and Research will be found in an appended table. As this Division has made no recent analyses of this supply since the chlorine apparatus has been working satisfactorily from a mechanical viewpoint, it is impossible to give at present any definite conclusion as to the efficiency of the chlorination process, although experience elsewhere would indicate that the amount of chlorine added would be sufficient to give good results in bacterial removal.

The analyses made in the past of the untreated water show high color, occasional turbidity and moderate hardness, indicating that the chief characteristic esthetically objectionable is the high color. The figures for nitrogen in its various forms and for oxygen consumed, while fairly high, are consistent with what might be expected for a water collected from a watershed of this character and where the stream flows through considerable swampy area. Chlorine in the water supply is present in amounts one and one-half to twice as great as is normal in this region. The bacterial counts in the untreated water are variable and somewhat high and the occasional presence of organisms of the B. coli type indicate at times the occurrence of active contamination. While some of this contamination may come from human sources, the inspection shows that the most probable source is wash from farm lands and highways.

In view of the above facts, the following conclusions may be drawn:

1. That the water supply of Ossining is of fair physical quality and although of somewhat high color and of occasional turbidity, these characteristics in themselves cannot be considered as detracting from the wholesomeness of the water.
2. That the inspection of the watershed together with confirmatory evidence furnished by the analyses indicate that at times the water is actively contaminated by surface wash from farmland and highways.
3. That opportunity for dangerous pollution has been largely minimized through the care exercised by the water works officials in carrying out frequent inspections of the watershed and the removal of possible sources of contamination.
4. That the treatment of this supply with liquid chlorine is an additional safeguard for the sanitary quality of the water and although experience with this method of sterilization is limited, there seems to be no reason why good results should not follow its use if carefully operated.
5. That the water rules enacted by this Department in 1894, while having served their purpose admirably, cannot be considered in the light of subsequent experience to be adequate to fully protect this watershed, especially with reference to the provisions for the care and disposal of human excreta.

In accordance with the above conclusions I beg to submit the following recommendations:

1. That the water works officials continue to maintain their care of the water supply, especially in respect to the enforcement of rules and regulations and the maintenance of sanitary conditions upon the watershed.
2. That, in view of the comparatively early date at which the water rules for this supply were enacted and the need for stricter provisions and notwithstanding the disinfection of the supply by chlorination and its general supervision by its consulting expert, the board of water commissioners apply to this Department for a revision of these rules.

ALBANY, N. Y., *June* 15, 1914

ANALYTICAL DATA OF WATER SUPPLIES

Abbreviations used to describe odors of water: 0, none; 1, very faint; 2, faint; 3, distinct; 4, decided; 5, strong; 6, very strong; a, aromatic; d, disagreeable; e, earthy; f, fishy; g, grassy; m, musty; v, vegetable

Municipality	County	Source	Date of collection	Physical				Chemical (Parts Per Million)											Bacteriological			
						Odor		Solids			Nitrogen as —						Hardness			B. Coli Type + = present — = absent		
				Color	Turbidity	Cold	Hot	Total	Loss on ignition	Mineral residue	Free ammonia	Albuminoid ammonia	Nitrites	Nitrates	Oxygen consumed	Chlorine	Total	Alkalinity	Bacteria per c.c.	10 c.c.	1 c.c.	1-10 c.c.
Ossining	Westchester	Tap, public supply	3/25/08	17	10	....	....	50	....	....	.018	.162	Tr.	0.04	3.00	2.25	17.6	....	1,900	+	—	—
Ossining	Westchester	Tap, public supply	5/11/08	28	10	....	....	52	....	....	.072	.176	Tr.	0.04	5.20	2.00	18.9					
Ossining	Westchester	Tap, public supply	2/25/09	7	12	....	....	60	20	40	.044	.158	Tr.	0.10	4.30	2.37	18.2	14.5	800	—	—	—
Ossining	Westchester	Tap, public supply	8/ 3/10	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2,000	—	—	—
Ossining	Westchester	Tap, public supply	11/29/10	35	10	....	....	65	27	38	.074	.208	.003	0.06	3.40	2.75	28.6	21.0	550	+	+	—
Ossining	Westchester	Tap, public supply	1/ 3/11	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	550	+	—	—
Ossining	Westchester	Tap, public supply	3/21/11	20	5	....	....	70	33	37	.004	.106	.002	0.10	4.30	4.00	26.0	19.0	100	+	—	—
Ossining	Westchester	Tap, public supply	5/15/11	15	5	....	....	67	13	54	.032	.130	.002	0.20	3.00	3.62	28.6	13.5	5,700	+	—	—
Ossining	Westchester	Tap, public supply	6/28/11	25	Tr.	....	....	75	27	48	.010	.106	.001	0.10	4.10	3.25	23.4	13.0	100	—	—	—
Ossining	Westchester	Tap, public supply	1/17/12	30	Cl.	....	....	80	21	59	.024	.118	Tr.	0.18	4.70	3.50	33.8	14.0	50	+	—	—
Ossining	Westchester	Tap, public supply	2/21/12	25	Cl.	....	....	76	12	64	.020	.122	Tr.	0.24	4.70	3.50	29.9	14.0	70	+	—	—
Ossining	Westchester	Tap, public supply	3/26/12	20	Tr.	....	....	82	17	65	.008	.134	Tr.	0.16	2.80	3.25	31.2	13.0	240	+	—	—
Ossining	Westchester	Tap, public supply	5/ 4/12	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	20	+	—	—
Ossining	Westchester	Tap, public supply	8/27/12	30	5	....	....	62	22	40	.002	.110	Tr.	0.08	4.50	2.25	26.0	16.0	375	+	+	+
Ossining	Westchester	Tap, public supply	10/15/12	22	5	....	....	70	13	57	.006	.148	.002	0.06	4.10	2.50	41.6	16.0	140	+	—	—
Ossining	Westchester	Tap, public supply	12/18/12	25	10	....	....	71	19	52	.012	.184	.001	0.10	5.00	4.00	32.5	16.0	200	+	—	—
Ossining	Westchester	Tap, public supply	1/21/13	20	7	1 v.	1 v.	76	....	....	.016	.128	.001	0.20	3.20	3.75	32.5	13.0	350	3+0—	0+3—	0+3—
Ossining	Westchester	Tap, public supply	2/24/13	40	5	2a.	2a.	67	....	....	.038	.178	Tr.	0.16	7.00	3.00	35.1	12.0	50	0+3—	0+3—	0+3—
Ossining	Westchester	Tap, public supply	4/ 7/13	15	25	3a.	3a.	86	....	....	.020	.220	.001	0.20	3.40	2.75	44.3	12.0	300	1+2—	0+3—	0+3—
Ossining	Westchester	Tap, public supply	5/19/13	37	Cl.	2 v.	2 v.	53	....	....	.008	.114	Tr.	0.06	4.50	2.50	26.0	11.0	70	1+2—	0+3—	0+3—
Ossining	Westchester	Tap, public supply	7/ 1/13	40	5	1 v.	1 v.	77	....	....	.004	.212	Tr.	0.06	6.35	3.50	26.0	17.0	150	1+2—	0+3—	0+3—
Ossining	Westchester	Tap, public supply	3/17/14	25	2	1 v.	1 v.	66	21	45	.040	.130	.001	0.20	5.60	3.50	36.4	14.0	475	1+2—	0+3—	0+3—

Copies of the above report were transmitted to the board of water commissioners and to Dr. Robert T. Irvine, health officer.

OTEGO

An inspection of the public water supply of Otego, N. Y., was made on April 29, 1914.

Otego is an incorporated village of about 550 inhabitants located in the southwestern part of Otsego county, 8 miles southwest of the city of Oneonta on the main line of the D. & H. R. R. The village has no public system of sewers although there are a few private sewers which empty into the Susquehanna river, the majority of houses being served by cesspools. The sources of the public water supply are springs and the west branch of the Otsdawa creek. The water works were owned originally by a water company and were bought by the village a few years ago, and are now under the control of the board of water commissioners of which Mr. A. D. Anable is president.

Practically the entire population of the village is served by the public water supply and while it is not possible to give accurate figures as to the daily consumption of water, this consumption may be estimated at approximately 200,000 gallons daily. This figure is placed somewhat high because large quantities of water are used by the Borden Creamery in the village. The water is distributed by gravity through about 5½ miles of cast-iron mains, ranging in diameter from 3 to 6 inches. Of the 150 service taps none are metered. The average pressure is about 60 pounds per square inch but in summer this may be reduced to 30 pounds per square inch. During extremely dry weather an additional supply is obtained by pumping directly from the main part of the Otsdawa creek into the village mains and from a driven well.

The water supply is obtained by developing several springs located at the foot of a steep bank in the valley of the west branch of the Otsdawa creek and from the west branch of the creek itself about two miles north of the village. The springs are piped to an adjacent distributing reservoir which also receives the water from the creek and from which the water supply is distributed directly to the village. There are five or six springs which are simply shallow basins connected with the reservoir by small iron pipes. The water from the creek is obtained through a 6-inch intake pipe which enters the creek just back of a small crib work dam about 300 feet from the reservoir. A driven well has also been constructed near the reservoir and is used occasionally in summer to supplement the spring and creek water. The water from this well is delivered to the reservoir by pumping and is used from one to three months each year, pumping being accomplished by a horizontal duplex pump belted to a gasolene engine contained in a small concrete house. The reservoir is about 15 feet wide, 70 feet long and 10 feet deep with an estimated capacity of about 80,000 gallons. The reservoir is of concrete and is covered by a wooden roof.

It has also been found necessary in times of drought to pump water directly from the Otsdawa creek, below the junction of the east and west branches, into the main leading to the village. The main has been tapped and a portable pumping outfit has been used to pump the water directly into the main. This supply is used only in case of extreme need, and whenever this need has arisen the people are warned to boil the water before using.

The inspection was made by Mr. E. S. Chase, assistant engineer of this Department, accompanied by Dr. W. S. Cooke, health officer of the village. On account of a severe thunder storm the entire watershed was not visited by the assistant engineer but general information regarding the location of the houses and other sanitary features of the watershed were obtained from Dr. Cooke.

There are in all, according to Dr. Cooke, about 31 dwellings on the watershed of the creek above the intake. The majority of these houses are well back from the stream along the highway which runs the entire length of the watershed. The nearest house is said to be about 500 feet from the stream and is located at the head of the creek, about 4 miles north of the intake. The population upon the watershed may be estimated at 150 and as this watershed is practically 7 square miles in area the population per square mile is about 21. The valley of the creek is about 6 miles long and averages a little more than a mile wide. The land adjacent to the creek is fairly level but the side slopes comprising the major portion of the watershed are rather steep. About 30 per cent of the watershed area is wooded but the remainder is devoted largely to agriculture and grazing. It is stated that the majority of houses on the watershed have outside closets which are provided with removable containers. It is also stated that the village is considering the construction of a dam at the site of the present reservoir in order to provide a much greater storage capacity.

The sanitary conditions on the watershed of the east branch of the Otsdawa creek are said to be such as to afford opportunity for pollution of this branch. Just above the point at which water from the main creek is pumped into the village main there are three or four houses upon or very near the bank of the stream and the conditions at these houses are such as to offer considerable opportunity for dangerous contamination. On account of the nearness of these sources of pollution to the supplementary intake the potential danger from them is particularly acute.

In case of the west branch watershed it seems probable that the chief source of contamination of the regular water supply is the surface drainage from the farm land which at times of rainfall undoubtedly reaches the brook and which may reach the springs and reservoir. While the conditions around the springs and reservoir could be much improved it would seem advisable for the village to consider the question of improvement to the whole water supply and to adopt such measures as would insure an adequate supply of water of satisfactory quality. It is evident that the use of the main creek water at the times of shortage is attended with considerable potential danger due to the greater opportunity for contamination of the water from that source.

The results of analyses of samples of water collected on May 17 and 18, 1914, by Dr. Cooke, together with the results of analyses made in the past by the Division of Laboratories and Research, are given in an appended table. These analyses show considerable variation in the character of the water and this variation may be partly due to different proportions of spring and creek water present in the supply as furnished to the village. Only one analysis of the water of the west branch of the Otsdawa creek is available and this analysis indicates that at the time the sample was taken the water received in the village was but very little different in character from the creek water. It is probable that the larger amount of village water is derived from the creek and that the most probable explanation for the variation in the quality of the village supply is due to variation in the quality of the creek water. The quality of the water might also be affected by the entrance of surface wash from adjacent land into the springs and reservoir.

The analyses show a somewhat colored water, at times turbid although usually fairly clear and on the whole of moderate hardness. The figures for nitrogen in its various forms are variable and at times rather high. The chlorine values are also variable and from two to six times as high as is normal in this vicinity. The bacterial results are decidedly unsatisfactory not only on account of the high total numbers but on account of the occurrence of organisms of the B. coli type in samples as small as 1/10 c. c.

In view of the above facts the following conclusions may be presented:

1. That the sanitary conditions upon the watershed of the east branch at the Otsdawa creek and the conditions around the springs and reservoirs are such as to make it evident that the water supply is not of a satisfactory condition. While it is difficult to interpret the results of the analyses except in the most general way due to the diversity of the sources of the supply and the intermittency with which the various sources are used, these analyses are confirmatory evidence of the unsatisfactory quality of the water.

2. That, while a large amount of contamination is probably due to surface wash from farm lands, pastures and manured fields, the comparatively large population upon the watershed forms a potential source of accidental or wilful contamination, minimized somewhat by the fact that the majority of houses are well back from the stream.
3. That, the sanitary conditions on the banks of the main Otsdawa creek, immediately above the point at which its waters are pumped into the village mains in times of drought, are such as to cause added contamination of the regular supply whenever this auxiliary supply is used.
4. That the need of an auxiliary supply might be largely, if not entirely, avoided should the village authorities take steps to prevent the waste of water in the village and should they provide sufficient storage for the regular supply.

In view of the above conclusions I beg to submit the following recommendations:

1. That the village authorities consider at once the improvement of their water supply and that they retain a competent sanitary engineer to advise them as to the best method for securing an adequate and safe water supply, either by improving their present regular supply or by developing a new and satisfactory source.
2. That the use of the east branch of the Otsdawa creek as a supplementary supply be avoided and that steps be taken at once to develop the present supply or a new supply which will be both adequate and of satisfactory quality.
3. That every effort be made by the village authorities to prevent the waste of water in the village in order to conserve the water supply as much as possible.
4. That the village authorities make a thorough inspection of the entire watershed of the west branch of the creek and remove any insanitary conditions which may be found affecting the quality of the water and in case any difficulty is experienced in abating any such conditions the authorities apply to this Department for the enactment of rules and regulations for the protection from contamination of their water supply.

ALBANY, N. Y., *June* 12, 1914

ANALYTICAL DATA OF WATER SUPPLIES

Abbreviations used to describe odors of water: 0, none; 1, very faint; 2, faint; 3, distinct; 4, decided; 5, strong; 6, very strong; a, aromatic; d, disagreeable; e, earthy; f, fishy; g, grassy; m, musty; v, vegetable

Municipality	County	Source	Date of collection	PHYSICAL				CHEMICAL (PARTS PER MILLION)											BACTERIOLOGICAL			
						ODOR		SOLIDS			NITROGEN AS —						HARDNESS			B. COLI TYPE + = PRESENT — = ABSENT		
				Color	Turbidity	Cold	Hot	Total	Loss on ignition	Mineral residue	Free ammonia	Albuminoid ammonia	Nitrites	Nitrates	Oxygen consumed	Chlorine	Total	Alkalinity	Bacteria per c.c.	10 c.c.	1 c.c.	1-10 c.c.
Otego	Otsego	Tap, public supply	5/ 8/08	16	8	....	....	41	....	....	.020	.080	Tr.	0.44	3.40	0.62	20.8	14.0	1,500	+	+	—
Otego	Otsego	Tap, public supply	5/31/09	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	250	+	—	—
Otego	Otsego	Tap, public supply	1/27/10	5	Cl.	....	....	48	10	38	.030	.032	.002	1.20	0.30	1.50	32.5	31.0	200	+	—	—
Otego	Otsego	Tap, public supply	7/21/10	Tr	Tr.	....	....	70	17	53	.024	.076	.001	0.50	1.30	1.63	44.3	40.0	12,500	+	+	+
Otego	Otsego	Tap, public supply	1/19/11	Tr.	2	....	....	60	21	39	.016	.046	.001	0.90	1.40	1.00	20.8	20.0	150	+	—	—
Otego	Otsego	Tap, public supply	4/ 3/11	Tr.	Tr.	....	....	68	32	36	.012	.020	.002	0.80	1.30	2.00	23.4	19.0	1,800	+	+	+
Otego	Otsego	Tap, public supply	7/20/11	10	Tr.	....	....	70	21	49	.008	.074	.001	0.40	1.00	1.25	39.0	35.5	2,500	+	+	+
Otego	Otsego	Tap, public supply	11/21/11	Tr.	Cl.	....	....	53	16	37	.026	.058	.005	1.50	0.70	2.75	23.4	13.0	140	+	+	—
Otego	Otsego	Tap, public supply	2/ 1/12	Tr.	Cl.	....	....	44	8	36	.020	.030	Tr.	0.80	1.20	1.50	23.4	22.0	140	+	+	—
Otego	Otsego	Tap, public supply	3/ 6/12	Tr.	Cl.	....	....	55	20	35	.018	.043	.001	0.90	1.10	1.50	27.3	15.0	300	+	+	—
Otego	Otsego	Tap, public supply	7/23/12	Tr.	Cl.	....	....	72	15	57	.002	.028	.001	0.40	1.20	2.50	41.6	40.0	160	+	—	—
Otego	Otsego	Tap, public supply	9/11/12	7	Cl.	....	....	80	20	60	.002	.064	Tr.	0.16	2.40	1.00	42.9	39.0	2,800	+	+	+
Otego	Otsego	Tap, public supply	10/25/12	30	15	....	....	72	19	53	.008	.180	.001	0.36	6.40	1.50	24.7	19.0	13,000	+	+	+
Otego	Otsego	Tap, public supply	12/ 7/12	10	40	....	....	58	17	41	.020	.094	Tr.	1.00	2.80	1.00	22.1	8.0	4,600	+	+	—
Otego	Otsego	Tap, public supply	3/ 3/13	10	3	1 v.	1 v.	47	—	—	.008	.050	Tr.	0.90	1.50	1.25	22.1	14.0	650	3+0—	0+3—	0+3—
Otego	Otsego	Tap, public supply	4/28/13	10	Cl.	1 v.	1 v.	46	—	—	.004	.044	Tr.	0.26	1.40	0.75	32.5	22.0	160	2+1—	0+3—	0+3—
Otego	Otsego	Tap, public supply	6/ 9/13	17	5	1 v.	1 v.	54	—	—	.010	.040	Tr.	0.14	1.30	1.50	31.2	30.0	120	2+1—	0+3—	0+3—
Otego	Otsego	Tap, public supply	7/17/13	7	Cl.	1 v.	1 v.	71	—	—	.012	.046	Tr.	0.50	1.80	2.50	37.7	38.0	210	3+0—	2+1—	2+1—
Otego	Otsego	Tap, public supply	5/18/14	10	1	1 v.	1 v.	47	14	33	.024	.056	Tr.	0.44	1.90	1.25	26.0	22.0	40	1+2—	0+3—	0+3—
Otego	Otsego	West Branch Otsdawa creek	5/17/14	25	2	1 v.	1 v.	57	14	43	.038	.066	.012	0.56	2.10	1.25	24.7	17.0	....	....	....	....
Otego	Otsego	Tap, public supply	5/18/14	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	50	1+2—	0+3—	0+3—
Otego	Otsego	Tap, public supply	5/18/14	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	325	3+0—	1+2—	0+3—

Copies of the above report were transmitted to the local board of water commisioners and to Dr. W. S. Cooke, health officer.

PHOENIX

An investigation of the public water supply of Phoenix, Oswego county was made on March 31, 1914.

Phoenix is an incorporated village of about 1800 population located in the southwestern part of Oswego county about 20 miles northwest of the city of Syracuse. The Syracuse & Oswego branch of New York Central & Hudson R. R. R. passes through the village, which also has connections with Syracuse & Oswego by the Syracuse and Northern Interurban electric railway. The Oswego branch of the State Barge canal goes through Phoenix. There are several factories here for manufacture of paper and textiles. The village has a public system of sewers built on the separate plan.

The waterworks, which were constructed in 1888, are owned and operated by the Phoenix Textile Co. of which Mr. Chas. B. Duffy of Buffalo, N. Y., is president and Mr. J. S. Nellis, local manager. The waterworks are in charge of Mr. T. H. Youmans, superintendent.

The water supply is derived from two sources, one being the unpurified Oswego river water, and the other a well or spring located in marsh land near the river about ½ mile north of the village center. The poor quality of the water supplied is recognized by both the company and the public and it is not used for drinking or culinary purposes. Water for these uses is obtained from the numerous private wells which are scattered throughout the village. Therefore only about 50% of the population is served with the public supply and these consumers use the water only for flushing water closets and sprinkling lawns. The daily consumption is from 120,000 to 180,000 gallons of which a large amount is used by the mills. The water is distributed by pumping through 5¼ miles of cast-iron mains ranging from 3 to 8 inches in diameter. There are about 300 service taps of which only about 20 are metered. The average pressure in the village is 50 lbs. per square inch. A cylindrical steel standpipe located on high ground in the eastern part of the village serves as an equalizing and pressure maintaining tank. This standpipe is 20 feet in diameter, 100 feet high and has a capacity of 188,000 gallons.

The spring supply is derived from a steel caisson about 15 feet in diameter which is sunk into the ground to a depth of approximately 20 feet. From the bottom of the caisson a series of radial lines of collecting tile extend into a water bearing stratum of gravel. Near the caisson is a small concrete pumping station 20 ft. x 25 ft. in which is located a Rumsey Triplex pump driven by an electric motor. This motor is controlled from the power plant of the Phoenix Textile Co.'s silk mills. The supply from the Oswego river is taken through a 6-inch intake pipe located above the dam across the river at Phoenix about 80 feet from the Phoenix shore and 6 feet below the water level. The end of the intake has a sack of brass wire of about ¼-inch mesh wrapped around it to act as a screen. The river water is pumped by a two stage 4-inch discharge centrifugal pump driven by a 50 horsepower motor. The water from the spring is supplied as much of the time as possible but in summer and at times of insufficient flow of ground water, the river-water is pumped to make up the deficiency.

The inspection of this water supply was made by Mr. E. S. Chase, assistant engineer, in this Department, in accordance with its policy of making special investigations of the public water supplies of the State. The assistant engineer was accompanied and given information by Mr. Youmans, the superintendent of the waterworks.

At the time of the inspection the water supply was being pumped from the spring and not from the river. The Oswego river was in flood at the time and in very turbid condition. The conditions at the spring or well made it evident that the spring water was being contaminated with river water. The low land near the well was flooded and the top of the caisson was surrounded by river water. Some of this river water was leaking into the caisson along the suction pipe from the pump. The surroundings of the spring are such that it is doubtful if this water is above suspicion even when the river is in its normal condition. It is located under a steep bank along the top of which runs the State road. About 200 feet from the well on top of the bank is a house with barns and accompanying outbuildings. Other houses are in the vicinity but at greater distances. The caisson is uncovered and thus there is opportunity for accidental or wilful contamination.

Mr. Youmans informed the assistant engineer that the company is considering the development of a water supply which will be satisfactory and safe for all domestic purposes and the company is uncertain as to the advisability of using the present spring with any new supply which might be developed. It is stated that about ½ mile or less north of the present well, there are springs which might be developed. These springs are near a small stream tributary to the Oswego river, and are said to derive their supply from an extensive stratum of water bearing gravel. No active steps have been taken as yet to develop any new supply.

The claim that the present supply is not used for drinking purposes seems to be substantiated by the following table of cases of typhoid occurring in Phoenix during the past seven years. While there were more cases in the earlier years given in this table than would be expected in a village of this population there have been no cases reported since August, 1911.

CASES OF TYPHOID FEVER BY MONTHS REPORTED FROM PHOENIX

	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1908....	2	0	0	0	1	0	0	1	0	0	0	0
1909....	0	1	0	0	0	0	2	0	0	0	0	0
1910....	0	0	0	0	0	0	0	0	1	1	0	0
1911....	0	0	0	0	1	0	2	4	0	0	0	0
1912....	0	0	0	0	0	0	0	0	0	0	0	0
1913....	0	0	0	0	0	0	0	0	0	0	0	0
1914....	0	0	....	....	....	....	....	....	....	....	....	.....

At the time of the inspection a sample was collected from the pump at the spring and the results of the analysis of this sample as well as others made in the past by the State Hygienic Laboratory are given in the appended table. These results indicate clearly the grossly contaminated condition of the water supply at nearly all times. The sample taken at the time of the inspection shows the effect of the contamination of the spring by the river water and owing to the constant danger of such contamination and its residual effects the use of this spring for drinking purposes must always be attended by danger to health.

From a consideration of the foregoing, it is apparent that the water supply of Phoenix is of extremely poor quality from a sanitary standpoint, but the quality is so poor that it is recognized as unsafe by both the citizens and the water company and hence is not used for drinking purposes. The surroundings of the spring and its location in low land liable to inundation by the Oswego river at times of flood indicate that this supply cannot be depended upon to produce a safe and satisfactory water at all times.

In view of the fact that the water company contemplates improving the quality of its water supply, I beg to make the following recommendations:

1. That the company retain a water supply engineer to advise them in respect to the proper methods for developing such a new and satisfactory supply.

RESULTS OF WATER ANALYSES

Abbreviations used to describe odors of water: 0, none; very faint; 2, faint; 3, distinct; 4, decided; 5, strong; 6, very strong; a, aromatic; d, disagreeable; e, earthy f, fishy; g, grassy m, musty v. vegetable

Municipality	County	Source	Date of collection	PHYSICAL				CHEMICAL (PARTS PER MILLION)											BACTERIOLOGICAL			
						ODOR		SOLIDS			NITROGEN AS —						HARDNESS			B. COLI TYPE + = PRESENT − = ABSENT		
				Color	Turbidity	Cold	Hot	Total	Loss on ignition	Mineral residue	Free ammonia	Albuminoid ammonia	Nitrites	Nitrates	Oxygen consumed	Chlorine	Total	Alkalinity	Bacteria per c.c.	10 c.c.	1 c.c.	1-10 c.c.
Phoenix	Oswego	Tap, public supply	5/13/08	23	9	....	....	252	....	....	.018	.152	.002	0.20	5.45	41.0	137.2	......	375	−	+	−
Phoenix	Oswego	Tap, public supply	12/16/08	8	8	....	....	418	....	....	.042	.120	.003	0.20	4.15	97.0	182.8	......	8,100	+	+	−
Phoenix	Oswego	Tap, public supply	3/16/09	Tr.	2	....	....	274	51	223	.010	.056	.060	1.40	0.40	22.12	221.5	178.0	950	−	−	−
Phoenix	Oswego	Tap, public supply	1/18/10	12	4	....	....	432	83	349	.124	.114	.004	0.02	3.81	111.0	180.0	......	17,000	+	+	−
Phoenix	Oswego	Tap, public supply	4/21/10	1	Tr.	....	....	298	38	260	.004	.018	.024	0.30	0.92	19.75	257.0	......	140	−	−	−
Phoenix	Oswego	Tap, public supply	5/26/10	15	20	....	....	343	69	274	.008	.118	.002	0.20	4.30	62.75	148.6	98.0	100	+	+	−
Phoenix	Oswego	Tap, public supply	6/29/10	12	25	....	....	520	151	369	.016	.088	.002	0.10	3.00	113.0	191.4	93.0	2,200	+	−	−
Phoenix	Oswego	Tap, public supply	9/21/10	12	5	....	....	770	241	529	.008	.126	.001	0.10	3.10	193.0	235.5	93.0	200	+	−	−
Phoenix	Oswego	Tap, public supply	11/15/10	15	100	....	....	401	80	321	.014	.128	.001	0.14	3.00	83.0	234.0	79.0	7,400	+	+	−
Phoenix	Oswego	Tap, public supply	12/28/10	15	10	....	....	584	89	495	.018	.060	.002	0.80	4.90	138.0	335.5	104.0	29,500	+	−	+
Phoenix	Oswego	Tap, public supply	2/14/11	20	8	....	....	457	116	341	.044	.060	.004	0.30	4.30	97.25	291.4	108.0	6,800	+	+	−
Phoenix	Oswego	Tap, public supply	4/7 /11	20	20	....	....	430	96	334	.014	.092	.003	0.30	3.70	91.0	157.2	93.0	3,800	+	+	+
Phoenix	Oswego	Tap, public supply	6/2 /11	15	200	....	....	553	91	462	.028	.222	.005	1.00	6.80	117.0	197.2	100.0	1,300	+	+	+
Phoenix	Oswego	Tap, public supply	9/8 /11	10	80	....	....	892	226	666	.004	.100	.001	0.10	2.80	200.0	243.0	86.0	1,300	+	+	+
Phoenix	Oswego	Tap, public supply	10/25/11	5	5	....	....	438	95	343	.022	.150	.001	0.10	1.80	19.0	180.0	83.0	3,300	+	+	−
Phoenix	Oswego	Tap, public supply	11/21/11	15	15	....	....	382	69	313	.058	.152	.005	0.10	3.80	95.0	250.0	78.0	3,000	+	+	+
Phoenix	Oswego	Tap, public supply	1/11/12	25	10	....	....	413	93	320	.054	.104	.010	0.20	5.30	91.0	282.0	92.0	1,600	+	+	+
Phoenix	Oswego	Tap, public supply	2/20/12	20	5	....	....	260	55	205	.058	.164	Tr.	0.36	4.93	33.5	122.8	92.0	1,600	+	+	−
Phoenix	Oswego	Tap, public supply	4/3 /12	20	10	....	....	219	38	181	.026	.118	Tr.	0.48	4.30	29.0	97.1	76.0	200	+	+	−
Phoenix	Oswego	Tap, public supply	4/29/12	25	10	....	....	209	47	162	.006	.112	Tr.	0.24	3.30	30.0	97.1	67.0	1,000	+	+	−
Phoenix	Oswego	Tap, public supply	10/11/12	15	20	....	....	454	106	348	.014	.108	.002	0.16	5.20	98.0	182.0	84.0	3,800	+	+	+
Phoenix	Oswego	Tap, public supply	11/29/12	20	5	....	....	301	22	279	.022	.124	.001	0.26	5.10	94.0	167.2	99.0	4,900	+	−	−
Phoenix	Oswego	Tap, public supply	1/13/13	....	....	....	....	....	....	....	....	....	....	....	....	....	....	......	22,000	3+0−	3+0−	3+0−
Phoenix	Oswego	Tap, public supply	2/18/13	15	5	1 v.	1 v.	419	....	....	.110	.088	.001	0.36	3.80	96.0	185.8	111.0	180	3+0−	2+1−	2+1−
Phoenix	Oswego	Tap, public supply	1/1 /13	20	25	1 m.	1 m.	225	....	....	.016	.116	.001	0.24	5.20	24.0	117.2	72.0	5,800	3+0−	1+2−	1+2−

ipply	5/13/13	15	2	1 a.	1 a.	325	....	....	.018	.094	.001	0.26	3.80	73.0	157.2	104.0	650	3+0−	3+0−	0+3−
ipply	6/24/13	5	2	1 v.	1 v.	290	....	....	.004	.028	.026	1.00	0.20	17.0	214.5	210.0	700	3+0−	1+2−	0+3−
ipply	7/29/13	7	2	2 a.	2 a.	520	....	....	.012	.082	.002	0.50	2.40	135.0	177.2	119.0	4,100	2+1−	0+3−	0+3−
ump house	3/31/14	5	5	....	....	425	65	360	.042	.074	.007	1.50	2.30	15.0	314.5	184.0	6,200	3+0−	0+3−	0+3−

2. That both the present supplies be abandoned, and a new supply be obtained from a source free from contamination, either by developing satisfactory springs or by filtration of the Oswego river.

3. That, pending the installation of a safe supply, the water company and health officer continue their warnings to the public against the use of the present supply for drinking or culinary purposes.

ALBANY, N. Y., *April* 20, 1914

Copies of the above report were transmitted to the Phoenix Textile Company and to Dr. E. G. Drury, health officer.

PORT CHESTER & RYE

An inspection of the public water supply furnished by the Greenwich (Conn.) Water Co. to the villages of Port Chester and Rye, N. Y., was made on May 4 and 6, 1914.

Port Chester and Rye are incorporated villages of about 15,000 and 5,000 inhabitants respectively. These villages are situated on Long Island Sound in the extreme southern part of Westchester county adjoining the Connecticut boundary. An investigation of the sanitary condition of Port Chester was made in 1909 by Prof. H. N. Ogden, special assistant engineer in the Department, and a report of this investigation is published in volume 2 of the Thirtieth Annual Report of this Department. The water supply of both Port Chester and Rye is furnished by the Greenwich Water Company which also furnishes water to Greenwich, Sound Beach, Riverside Cos Cob and East Port Chester, all of which are located in Connecticut. An inspection of the filtration plant of the Greenwich Water Co. was made by this Department in 1909 and a report of this inspection may be found on page 438, vol. 2, of the Thirtieth Annual Report of this Department.

The water supply is derived from two impounding reservoirs, known as the Putnam and Rockwood lakes and in addition to these lakes water is diverted from Pipen brook, a small stream north of these reservoirs. Auxiliary supplies may be developed by pumping from Bryam river west of the reservoir and from Mianus river, northeast of the reservoirs. The Putnam reservoir has a capacity of 600,000,000 gallons. The Rockwood reservoir a capacity of 575,000,000 gallons and the diverting reservoir at Pipen brook, 15,000,000 gallons. The watersheds are 2.2; 0.8; and 1.8 square miles respectively giving a present total watershed area of 4.8 square miles. The Mianus river above the pumping station has a watershed of 17.3 square miles and the Bryam river 4.5 square miles. It is proposed to develop both these auxiliary supplies into permanent sources and a 6½-ft. tunnel is now under construction to connect Bryam river with Rockwood lake. The development of this supply may be hindered by the objections of riparian owners. The water company is also considering the construction of a 40-ft. dam across the Mianus which would form an impounding reservoir with a storage capacity of five or six billion gallons.

The purification plant consists of 14 mechanical pressure filters, having a combined capacity of 4,000,000 gallons daily. Eight of these filters were described in the report of the inspection in 1909. The six additional filters were completed in 1913, and are of the same general type. These new filters are housed in a separate stone building from the others and are used to supplement the older filters at times of maximum draught upon the system. They are 4 feet high and 10 feet in diameter, each having a capacity of 250,000 gallons daily. The method of operation and control of the new filters is the same as that for the older filters. Alum is applied from solution tanks through which a part of the raw water is shunted, this by-passed water dissolves some of the alum carrying it into the raw water before application to the filters, the amount of alum applied varying according to the quantity of water shunted through the dissolving tanks. The filters are cleaned at least once a day and when the water is particularly turbid, as often as twice a day. Cleaning is accomplished by reversing the flow of water until the waste water runs clear. After the filters are washed the filtrate is allowed to run to waste for the first two or three minutes.

From the filters the water is carried by gravity through three lines of cast-iron mains to a steel standpipe about two miles due south. This standpipe is 80 feet in diameter, 35 feet high and has a capacity of 1,330,000 gallons. The mains to Greenwich lead from this standpipe and about one-half mile south of the standpipe, two mains branch off to Port Chester, these mains being 10 inches and 16 inches in diameter. The water is distributed by gravity under an average pressure of about 120 pounds through 114 miles of cast-iron mains varying in size from 4 to 30 inches in diameter. Of these mains 72 miles are in Greenwich and 42 in Port Chester and Rye. The average daily consumption is about 3½ million gallons, although in summer the consumption may run as high as six million gallons daily. There are in all 5,680 service taps, of which 2,805 are in Greenwich and 2,875 are in Port Chester and Rye. In Greenwich 80% of the service taps are metered while in Port Chester and Rye but 50% are metered. It is estimated that 16,000 people are served in Connecticut and 19,000 in New York. About 250 new house connections are being made each year. The total valuation of the water works as reported to the Public Service Commission of Connecticut is about $1.600,000.

The inspection of the water supply was made by Mr. E. S. Chase, assistant engineer in this Department. Nearly the entire watershed areas of Putnam and Rockwood reservoirs of Pipen brook and of Mianus river above the auxiliary pumping station were visited. The Bryam river watershed was not covered as time did not permit.

Putnam and Rockwood reservoirs are artificial lakes formed by earthen dams with masonry core walls and inner slopes riprapped. Putnam reservoir is about one mile long and ¼ mile wide, while Rockwood reservoir is about 1¼ miles long and ⅛ of a mile wide. There are no houses very near Putnam reservoir nor any of its tributaries. About 2,500 acres, a large part of which is on this watershed comprise a large country estate. This estate, it is understood, is provided with a sewerage system and a disposal plant, comprising a subsurface irrigation field. The estimated population on this watershed is 100, or 45 per square mile. On the watershed of Rockwood reservoir there are but two houses and the population per square mile may be estimated as 12. As far as could be determined there is no direct pollution of the water supply on these two watersheds. Some indirect pollution may occur from road wash and from manured fields, but even this would be slight, as the roads on the whole, are well away from the reservoirs, and the borders of the lakes are owned by the water company which controls in all about 1100 acres. Fishing in these lakes is allowed only with consent of the water company. A patrol of the lakes is maintained by the company.

The Pipen brook supply is developed by the construction of a concrete diverting dam across this brook about 1½ miles northeast of the upper end of Rockwood lake. While the reservoir thus formed has an available capacity of 15,000,000 gallons, it usually provides very little storage as the ordinary flow of the brook is carried to Rockwood lake at once through a 20-inch pipe line. The watershed of Pipen brook above the diverting dam is about 3 miles long and one mile wide in its widest portion. Three-fourths of this watershed is within New York State. The majority of the area is cleared land, devoted to agriculture. Near the head of the stream there is considerable swampy area and some wooded areas. There are in all some ten houses on the watershed with an estimated population of 40 or 22 per square mile. One house near the head of this brook is almost directly on its banks and the privy is within a few feet of the brook. With this exception, the general sanitary conditions along the brook seem to be good.

The Mianus river rises near the village of Banksville, Conn., through which it flows in a northerly direction for about 4 or 5 miles to the village of Bedford, N. Y., at which point it makes a wide detour to the east and then flows southerly 10 to 12 miles until it discharges into Long Island Sound a few miles east of the village of Greenwich. About six miles below the village of Bedford and one mile northeast of the upper end of Rockwood lake, the auxiliary pumping station has been installed. At this point a small submerged timber dam has been thrown across the river and behind this dam are the intakes to the pumps. There are three steam driven, Worthington pumps of 2½ million gallons daily capacity. These pumps discharge into the 20-inch main leading from Pipen brook to Rockwood lake.

Immediately above the intake for a distance of four or five miles, the stream flows through a narrow valley with steep, wooded sides. From Bedford to its source the character of the valley is quite different as the bottom land varies in width from ¼ to 1 mile in width. Between Banksville and Bedford the stream flows through large areas of swampy low land. The greater portion of the drainage area, however, consists of high and rugged hills, sparsely covered with second growth timber. The soil is gravel and sand and the hills are outcrops of granite. A rough estimate would place the percentage of sparsely wooded area at 50%. This vicinity is becoming more and more in demand for country estates.

With the exception of the two villages there are few and scattered houses upon this watershed above the water supply intake. The total number of houses upon the watershed is approximately 200 with an estimated population of 1,000. The majority of these houses is well back from the stream. The village of Bedford has about 50 houses with a population of about 250. The majority of these houses is separated from the stream by a strip of low land several hundred feet in width. This village is not provided with a sewer system or a public water supply. The houses are supplied with water from private sources and are served by cesspools. The village is purely residential and is used for summer residences. About a mile south of the village are feldspar quarries employing about 30 men. A tributary of the river flows near the quarries and chance pollution might occur at this point. The village of Banksville contains about 30 houses and an estimated population of 150. This village is at the extreme headwaters of the river. There are no public sewers and no public water supplies. At one point in this village there are two privies located almost directly upon the stream and the topography is such that the drainage from the whole village can quickly reach the stream. Aside from the danger of pollution from permanent sources there is also the added danger of pollution of an accidental nature due to the numerous highways which traverse this watershed.

The Bryam river watershed, which was not visited at the time of this inspection, is northwest of the reservoirs, the point of the proposed intake being about one mile west of the upper end of Putnam lake. This watershed extends 3 miles north from the intake and is about 1½ miles wide. According to the U. S. Geological Survey Topographic Map, there are 35 dwellings upon the watershed, which would give an approximate population of about 175, or 39 per square mile. According to Mr. Wilson, Superintendent of the Greenwich Water Company, there are some shacks occupied by foreign laborers upon the watershed, which would have to be removed as soon as the Bryam river becomes a regular source of supply. Other conditions would also have to be improved. Up to date this supply has not been used and it will be some time before the tunnel to Putnam lake will be finished.

At the time of the inspection samples of water were collected from Pipen brook, Mianus river, Putnam reservoir, a tap in the filter house (filtered water) and a tap in the village of Greenwich (filtered water). These samples were analyzed by the Division of Laboratories and Research and the result of these analyses together with analyses made in the past of samples of the filtered supply taken in Port Chester and Rye will be found in the appended table.

These results show a very highly colored water even after filtration, but with moderate bacterial counts as a rule and an absence of organisms of the B. coli type in quantities of sample as large as 10 c.c. in approximately one-half the samples. The chlorine figures are somewhat higher than normal in this region. The high albuminoid ammonia figures and oxygen consumed are consistent with the character of this water and are probably due largely to organic vegetable matter. The samples taken at the time of the inspection show very high bacterial counts in the untreated waters, but it should be noted that these samples were nearly 48 hours in reaching the laboratory, during which time the ice in the bacterial sample outfits had melted. The samples of filtered water, however, were very low in total number of bacteria and showed absence of B. coli organisms in the 10 c.c. inoculations. The water from Pipen brook was very highly colored and somewhat turbid, with a very high organic content as shown by the oxygen consumed figure. The bacterial content was very high, although there was some reduction in the reservoir due probably to sedimentation, and B. coli were present in 1 c.c. inoculation. The sample from Mianus river was also highly colored, with a high organic content, with a large number of bacteria and with B. coli in 1 c.c. The sample from Putnam reservoir, which represents the raw water shortly before filtration, was fairly low in bacteria and had organisms of the B coli, type in two of three 10 c. c. inoculations only. It is probable that the raw water taken for filtration is usually fairly low in bacteria and of a fair sanitary quality due to the beneficial effects of the large storage capacity. The water company has weekly analyses made of the raw filtered water, these analyses serving as a guide in the application of alum and operation of the filter.

From a consideration of the above facts, the following conclusions may be drawn:

1. That the regular supply furnished by the Greenwich Company is of a reasonably safe and satisfactory quality, being protected by the double safeguard of storage and filtration.
2. That the reservoirs are subjected to little or no direct pollution although some direct pollution reaches Pipen brook at the premises noted in this report.
3. That the chief menace to the sanitary quality of the water is the danger from accidental or wilful contamination due to the comparatively large population on the watersheds, although this danger is minimized by the patrol maintained by the water company.
4. That the watershed of the Mianus river is too well-populated to render its water safe for use as a public supply without purification on account of the constant opportunity for accidental pollution and the same conclusion applies to the Bryam river watershed.

In view of the above conclusions I beg to make the following recommendations:

1. That the water company continue its watchfulness of the sanitary conditions of the various watersheds and that they take steps to improve the sanitary conditions at the premises on Pipen brook, noted in this report.
2. That upon developing either the Bryam river or Mianus river supply, the water company remedy whatever insanitary conditions may exist upon these watersheds.
3. That, in case the water company experiences any difficulty in abating insanitary conditions upon any portion of the watersheds within the State of New York, application be made to this Department for the enactment of rules and regulations for the protection from contamination of that part of the water supply which is located within New York State.

ALBANY, N. Y., *May* 25, 1914

RESULTS OF WATER ANALYSES

Abbreviations used to describe odors of water: 0, none; 1, very faint; 2, faint; 3, distinct; 4, decided; 5, strong; 6, very strong; a, aromatic; d, disagreeable; e, earthy; f, fishy; g, grassy; m, musty; v, vegetable

Source	Date of collection	PHYSICAL				CHEMICAL (PARTS PER MILLION)											BACTERIOLOGICAL			
				ODOR		SOLIDS			NITROGEN AS —						HARDNESS			B. COLI TYPE + = PRESENT — = ABSENT		
		Color	Turbidity	Cold	Hot	Total	Loss on ignition	Mineral residue	Free ammonia	Albuminoid ammonia	Nitrites	Nitrates	Oxygen consumed	Chlorine	Total	Alkalinity	Bacteria per c.c.	10 c.c.	1 c.c.	1-10 c.c.
(Greenwich Water Company of Greenwich, Conn.):																				
(Port Chester and Rye, N. Y., Westchester):																				
Tap, Port Chester	1/18/12	25	Cl.	....	....	50	16	34	.016	.118	.001	0.14	4.30	3.50	23.4	14.0	50	+	—	—
Tap, Rye	1/18/12	25	Cl.	....	....	59	17	42	.014	.128	.001	0.14	4.30	3.25	24.7	13.0	20	—	—	—
Tap, Port Chester	2/28/12	25	Cl.	....	....	59	32	27	.034	.106	.001	0.16	5.80	3.25	22.1	15.0	40	+	—	—
Tap, Rye	2/22/12	25	Cl.	....	....	70	22	48	.024	.120	.001	0.16	4.60	3.50	24.7	13.0	120	+	—	—
Tap, Port Chester	3/28/12	25	Tr.	....	....	50	13	37	.034	.098	Tr.	0.10	4.00	3.25	20.8	10.0	130	+	—	—
Tap, Rye	3/28/12	15	Tr.	....	....	55	14	36	.044	.122	Tr.	0.08	3.50	3.25	20.8	10.0	110	+	—	—
Tap, Port Chester	5/4 /12	15	Tr.	....	....	46	11	35	.006	.112	Tr.	0.04	3.50	3.00	22.1	8.0	50	—	—	—
Tap, Rye	5/4 /12	20	1	....	....	59	21	38	.010	.094	Tr.	0.08	4.30	2.50	12.7	9.0	40	—	—	—
Tap, Port Chester	8/29/12	19	Cl.	....	....	57	21	36	.002	.142	Tr.	0.06	3.50	2.75	20.8	15.0	170	—	—	—
Tap, Rye	8/29/12	12	Tr.	....	....	64	14	50	.004	.112	Tr.	0.06	3.00	3.00	22.1	15.0	120	+	—	—
Tap, Port Chester	10/17/12	45	Tr.	....	....	54	14	40	.004	.192	Tr.	0.14	3.20	2.50	32.5	19.0	120	+	—	—
Tap, Rye	10/17/12	30	2	....	....	58	26	32	.004	.166	Tr.	0.14	4.40	3.12	23.4	19.0	30	—	—	—
Tap, Port Chester	12/19/12	25	Tr.	....	....	59	24	35	.080	.168	.002	0.26	4.70	3.75	23.4	12.0	80	+	—	—
Tap, Rye	12/19/12	25	Tr.	....	....	75	11	64	.050	.158	.003	0.22	3.80	4.00	26.0	12.0	150	+	—	—
Tap, Port Chester	1/22/13	30	Tr.	2 a.	2 a.	60	....	....	.024	.112	Tr.	0.40	6.20	3.75	19.5	7.0	60	2+1—	0+3—	0+3—
Tap, Rye	1/22/13	35	Tr.	1 v.	1 v.	58	....	....	.012	.126	.001	0.44	4.90	4.00	22.1	7.0	60	1+2—	0+3—	0+3—
Tap, Port Chester	2/25/13	15	Tr.	1 v.	1 v.	88	....	....	.020	.120	Tr.	0.46	3.00	4.00	20.8	8.0	110	0+3—	0+3—	0+3—
Tap, Rye	2/25/13	20	Tr.	2 v.	1 v.	62	....	....	.014	.144	.001	0.46	3.00	3.75	20.8	7.0	250	0+3—	0+3—	0+3—
Tap, Port Chester	4/9 /13	20	Tr.	2 v.	2 v.	49	....	....	.014	.098	Tr.	0.24	3.00	3.50	22.1	7.0	150	0+3—	0+3—	0+3—
Tap, Rye	4/9 /13	20	Tr.	1 v.	1 v.	55	....	....	.010	.104	.001	0.24	3.30	3.50	19.5	7.0	80	0+3—	0+3—	0+3—
Tap, Port Chester	5/21/13	20	2	2 v.	2 v.	60	....	....	.010	.120	Tr.	0.08	3.10	3.25	22.1	11.0	100	0+3—	0+3—	0+3—

Tap, Rye	5/21/13	25	1	1 v.	v.	62	....	..	.014	.102	.001	0.10	3.60	3.00	27.3	8.0	130	0+3—	0+3—	0+3—
Tap, Port Chester	6/30/13	25	Tr.	1 v.	v.	64	....	..	.006	.152	Tr.	0.04	3.40	3.75	22.1	10.0	....	1+2—	0+3—	0+3—
Tap, Rye	6/30/13	20	2	2 v.	v.	58	....	..	.004	.126	Tr.	0.04	3.40	3.00	22.1	8.0	500	1+2—	0+3—	0+3—
Tap, Port Chester	3/18/14	20	1	1 v.	v.	54	15	39	.018	.114	.001	0.06	5.00	3.25	18.2	11 0	300	0+3—	0+3—	0+3—
Tap, Rye	3/18/14	18	1	1 v.	v.	49	13	36	.026	.116	Tr.	0.80	4.50	3.00	18.2	7.0	200	1+2—	0+3—	0+3—
Pipen Brook inlet to reservoir	5/6 /14	....	....	....	..	....	....	..	....	....	....	....	....	.....	......	......	16,500	3+0—	3+0—	0+3—
Pipen brook reservoir	5/6 /14	90	10	1 v.	v.	60	28	32	.018	.204	Tr.	.06	14.0	1.62	12.7	8.0	8,100	3+0—	3+0—	0+3—
Mianus river, auxiliary pumping station	5/6 /14	45	5	1 v.	v.	49	22	27	.018	.148	Tr.	.08	8.20	2.00	19.5	16.0	43,000	3+0—	3+0—	0+3—
Putnam reservoir, raw water	5/6 /14	....	....	....	..	....	....	..	....	....	....	....	....	.....	......	......	300	2+1—	0+3—	0+3—
Filter house; filtered water	5/6 /14	....	....	....	..	....	....	..	....	....	....	....	....	.....	......	......	10	0+3—	0+3—	0+3—
Tap in Greenwich, filtered water	5/6 /14	5	Tr.	1 v.	v.	45	12	33	.004	.082	Tr.	0.14	2.40	2.75	18.2	3.0	20	0+3—	0+3—	0+3—

Copies of this report were transmitted to the **Greenwich Water Company**, to Dr. William J. Sheehan, health officer of **Rye**, and to Dr. B. J. **Sands**, health officer of Port Chester.

SCHROON LAKE

An inspection of the public water supply of the village of Schroon Lake was made on July 21, 1914.

Schroon Lake is an unincorporated village in the southern part of Essex county, located at the northern end of the lake from which it takes its name. The nearest railroad station is Riverside on the North Creek branch of the D. & H. R. R. The village has a resident population of about 350, but during the months of July and August summer visitors increase this number to 1,000 or 1,200. There are no industries in the village which is chiefly a summer resort possessing two or three summer hotels and several boarding houses. There is no system of sewers in the village, the hotels and some of the houses being served by cesspools while the remainder of the houses are served by outside closets.

The water works which were constructed in 1900 are owned and operated by the Schroon Lake Water Supply Company, of which Mr. G. H. Wilson of Albany, N. Y., is president. The regular supply is derived from a small spring-fed reservoir located in the hills about 1½ miles west of the village. An auxiliary supply for use during the summer has been developed from Bullet pond (Little Rogers pond), 2½ miles west of the village, by laying a line of pipe from this pond to the regular reservoir.

Nearly the entire population of the village is served by the public supply through about 80 service taps. None of these services are metered and there is no information available as to the daily consumption. In all there are about 3½ miles of water mains ranging in size from 1 to 10 inches in diameter. The distribution is by gravity with an average pressure in the village of 120 pounds per square inch.

The inspection of the water supply was made by Mr. E. S. Chase, assistant engineer in this Department. Following the receipt of information from Dr. J. A. Smith, sanitary supervisor of district No. 1, in respect to the possibility of contamination of the waters of Bullet pond by campers along its shore. The assistant engineer was accompanied and aided by Dr. John Breen, health officer of Schroon Lake.

The regular supply, obtained by impounding a small spring-fed brook, is adequate for the needs of the resident population of the village but is insufficient during the summer season. The reservoir which impounds this spring supply is formed by a rubble masonry dam and covers about ¼ of an acre. When full the maximum depth of water is about 5 feet and the capacity may be estimated at 250,000 gallons. The intake is a 10-inch cast-iron pipe, the end of which is about 20 feet from shore and about 6 inches above the bottom of the reservoir at its deepest point. The end of the pipe is covered with a copper screen of 1/16-inch mesh. The reservoir is surrounded by a wooden fence which is in a dilapidated condition and it is the intention of the water company to replace this shortly with a wire fence. Immediately adjacent to the reservoir the land is used for pasturage and hoof prints on the shore of the reservoir showed that cattle had had access to the reservoir. The fence is close to the bank of the reservoir and as there are no ditches for removal of surface wash from the vicinity of the reservoir, it is evident that at times of rainfall there is opportunity for pollution from the pasture land. Outside of this pollution of animal origin, there seems to be no chance for pollution of any other kind. The surface watershed area is less than 1/10 square mile, uninhabited and practically covered with hardwood timber. The soil is sand and gravel covering the underlying granite rock.

On account of the insufficiency of the reservoir supply in summer, a 1½-inch pipe line was laid a few years ago from Bullet pond to this reservoir in order to furnish an additional supply of water. At the time of the inspection this pipe line was out of service as work was being carried on in laying a new and larger pipe line and as the reservoir was practically empty there was insufficient water to meet the draught from the village.

Bullet pond is a small spring-fed pond of about 30 acres, but whose depths and capacity are unknown. The surface watershed adjacent to this pond is but 3/10 of a square mile in area and upon this area there are two houses, only one of which is occupied. This house is about ¼ mile from the pond and is inhabited by but one person. The soil is sand and gravel and nearly the entire area is covered by trees. Part of the shore of the pond is owned by the State of New York as a part of its Adirondack Reservation. Another part is owned by the estate of the father-in-law of the president of the water company. The water company contemplates purchasing the remainder of the shore, which is of comparatively small extent, in order to protect the pond from contamination. Last year and on preceding years there have been two or three camping parties upon the shores of the pond, but up to the time of the inspection there had been none during the present year. With the exception of danger of contamination by campers or other intermittent visitors to the pond, there seems to be no reason why this supply should not furnish an ample and satisfactory supply from the sanitary point of view. The danger of accidental or wilful contamination by campers in so popular a summer resort district is a real danger and every precaution should be taken to guard against such contamination.

At the time of the inspection samples were taken from Bullet pond and from a tap in the village, the results of the analyses of which made by the Division of Laboratories and Research are given in the accompanying table.

These analyses show that at the time the sample was taken, the village supply was rather high in color and moderately soft, while the figures for nitrogen in the various forms indicate the presence of comparatively little decomposing organic matter. The oxygen consumed value is rather high but the chlorine content is about normal for unpolluted waters in this region. The bacteriological results are not satisfactory either in the total count or in the presence of organisms of the B. Coli type in samples as small as 1 c.c. While organisms of this type may be derived from either human or animal wastes, it is evident that in this case the most probable source is the cattle pastured adjacent to the reservoir. The sample from Bullet pond, of which a bacteriological analysis only was made, gives results more satisfactory, being low in total number of bacteria and having no organisms of the B. coli type present in any of the inoculations tested. It must be noted, however, that a single analysis indicates only the quality of the water at the time the sample was taken and does not show its quality at all times and under all conditions.

In view of the foregoing facts the following conclusions may be drawn:

1. That the water taken from both the reservoir and from Bullet pond should be of satisfactory sanitary quality if precautions are taken to prevent accidental or wilful contamination and, in case of the reservoir, if steps are taken to exclude from it the surface drainage of the surrounding pasture lands.
2. That an adequate supply of water of unquestioned quality is an urgent necessity in this village and that the action of the water company in laying a larger pipe from Bullet pond is a step in the right direction.

In view of the above conclusions, I beg to submit the following recommendations:

1. That the water company protect the reservoir from wash from the adjacent pasture land by proper drainage ditches and from cattle by adequately fencing off the area around the reservoir.
2. That, in order to protect Bullet pond from possible contamination by campers or other intermittent visitors, the water company acquire the control of all the shore of the pond not owned by the State of New York.
3. That, in case the water company experience any difficulty in protecting their supply from contamination, they apply to this Department for the enactment of rules and regulations for this purpose.

ALBANY, N. Y., *August* 12, 1914

RESULTS OF WATER ANALYSES FOR SCHROON LAKE

Laboratory No.			
Source		Tap in village	Bullet pond
Collected on		July 21, 1914	July 21, 1914
Color		20	
Turbidity		trace	
Odor, cold		1 v.	
Odor, hot		1 v.	
Solids, total		55	
Loss on ignition		14	
Mineral residue		41	
Ammonia, free		.002	
Ammonia, albuminoid		.036	
Nitrites		.001	
Nitrates		0.10	
Oxygen consumed		4.50	
Chlorine		0.38	
Hardness, total		27.3	
Alkalinity		25.0	
Bacteria per c.c		550	70
B. coli type	10 c.c.	3+0—	0+3—
	1 c.c.	1+2—	0+3—
	1/10 c.c.	0+3—	0+3—

Results are expressed in parts per million. + Present. — Absent.

Abbreviations used to describe odors of water: 0, none; 1, very faint; 2, faint; 3, distinct; 4, decided; 5, strong; 6, very strong; a, aromatic; d, disagreeable; e, earthy; f, fishy; g, grassy; m, musty; v, vegetable.

Copies of the above report were transmitted to the Schroon Lake Water Company, to Dr. John Breen, health officer, and to Dr. J. A. Smith, sanitary supervisor.

SHERBURNE

An inspection of the public water supply of the village of Sherburne was made on March 4, 1914.

Sherburne is an incorporated village of about 1,000 population located in the northern part of Chenango county, about 41 miles southwest of Utica on the Utica division of the Delaware, Lackawanna & Western railroad. The village is largely residential, although there are one or two yarn mills located in the village. The surrounding country is devoted to agriculture. There is no public system of sewers, the village being served by privies and cesspools.

The public water supply is owned and operated by the municipality under the direction of the board of water commissioners of which Mr. Frank Cashman is chairman. No men are employed regularly to take care of the system.

The supply is derived from two reservoirs located about 2 miles east of the village. These reservoirs are formed by two earthen dams thrown across a branch of Mad brook. The lower reservoir and distributing system were constructed in 1882 and the upper reservoir in 1896. The distribution system consists of 4 miles of cast-iron pipe ranging in size from 4 to 10 inches. There are about 325 service taps, none of which are metered. It is estimated that 95 per cent of the village population is supplied with the water and about 200 people outside the corporate limits. The water is distributed by gravity and the average pressure in the village is 90 pounds per square inch. No data are available as to the water consumption. A driven well at the schoolhouse is used to some extent by a number of adjacent families during the summer because the well water is cooler and more palatable than the public supply. The public supply has proved sufficient at all times, although in the fall of 1913, restrictions had to be placed on the use of the water for sprinkling purposes.

There are no regular periods for the flushing of the mains although this is done three or four times during the summer. The entire system of pipes was thoroughly cleaned by scraping about 3 years ago. The reservoirs have been cleaned but once since built. This cleaning occurred 7 or 8 years ago after the dam at the upper reservoir gave way during a very heavy rainfall. As a great deal of dirt was washed into the lower reservoir at the time, upon the resumption of service of the upper reservoir, the lower one was thoroughly cleaned.

The lower reservoir has a capacity of about 12,000,000 gallons and the upper about 20,000,000 gallons. These capacities are increased somewhat in the spring by placing flash boards across the waste weirs. The inner slopes of the dams are faced with rip-rap. The lower reservoir is protected from surface wash by drainage ditches. The intake leading into the main to the village from the lower reservoir, is 6 feet above the bottom of the reservoir and is protected by a ½-inch mesh brass screen. Both reservoirs are fenced off from the adjacent land. At the head of the upper reservoir over 100 acres of the watershed have been given to the village and this area is to be planted with Norwegian pine.

The watershed is about 3 miles long and 1 mile wide with an estimated area of about 4 square miles. The soil is gravel mixed with loam, overlying rock strata of soft shale. The stream above the reservoirs has little fall and flows through a narrow strip of level ground, but on both sides of this strip the hills rise rather steeply. The watershed has been well cleared of trees and a rough estimate would place the wooded area not over 10 per cent. The land is used for farming and grazing purposes.

In 1908 rules and regulations for the protection of this supply from contamination were enacted by the State Commissioner of Health. These rules were enacted subsequent to and as a result of an outbreak of typhoid in the village, a report of the investigation of which will be found in the Twenty-ninth Annual Report of this Department, vol. 1, page 513. This investigation brought forth evidence which pointed to the probable infection of the water supply by laborers engaged in cutting ice from the reservoirs.

The investigation of the water supply was made by Mr. E. S. Chase, assistant engineer in this Department. On account of deep snow and drifts over the roads, it was found impracticable to cover the entire watershed of this supply, but a general view of the watershed and the location of the various buildings could be obtained.

There are in all 12 houses with accompanying outbuildings, 2 schoolhouses and 1 small cemetery on this area. Two of the houses are vacant at present. The population is 25 or about 6 per square mile and there are about 50 head of cattle kept on the watershed. All but two of the houses are well back from the stream although the slopes are steep. Two farms located about ¼ of a mile above the upper reservoir are rather near the brook, and while these places were not visited, it seemed probable from a general view of their location that surface wash from around these places would reach the brook in a comparatively short time. This might not be particularly dangerous as these places have their privies 200 to 500 feet from the stream. In the summer of 1913 the water commissioners made an inspection of the watershed and found that none of the provisions in the rules and regulations were being violated. In general it may be said that pollution which might reach this supply would probably be that from drainage from manured fields and pastures. There is also some danger of contamination of the supply by workmen when engaged in setting out trees on the property owned by the village. Two roads cross the brook which also gives opportunity for pollution by road wash and, as is true with all surface supplies, there is the danger of chance contamination by hunters or other transient visitors upon the watershed. The danger arising from contamination which might reach the upper reservoir is somewhat minimized by the storage period to which the water is subjected. Estimating the daily water consumption at 120,000 gallons, the 33,000,000 gallons capacity of the reservoir would give about 270 days' storage.

Some trouble has been experienced with tastes and odors from algae growth. These tastes have been described as "fishy" and probably come from microscopic vegetable organisms known as algae. These tastes are said to be most noticeable in the spring but continue during the summer. Since the water mains were cleaned less trouble has been experienced with the tastes and odors. Three or four years ago an attempt was made to kill off these growths in the reservoirs by application of copper sulphate. Only 35 pounds of the copper sulphate were used and this amount was probably too small to accomplish much good. In order to apply the copper sulphate in the proportion of ½ part of chemical to 1,000,000 parts of water by weight, 50 pounds of chemical should be added to the lower reservoir and 120 pounds to the upper. These microorganisms, known as algae, cannot be considered as being specifically prejudicial to public health although they might cause minor intestinal troubles in persons of weak constitutions or among invalids and children. These microscopic organisms are chiefly objectionable from the tastes and odors they produce.

At the time of the inspection, samples of water were taken for chemical and bacteriological analyses. The results of these analyses together with others made in the past by the State Hygienic Laboratory will be found in the appended table.

These analyses show a soft, slightly colored water usually clear but at times somewhat turbid. Except at times of algae growth and of turbidity, this water should be of satisfactory quality from the physical standpoint. The figures for nitrogen in the form of free and albuminoid ammonia are fairly low for a surface water, indicating comparatively small amounts of decomposing organic matter. The nitrogen in the form of nitrites and nitrates varies somewhat and this variation may be due to changes in the amount of ground water reaching the supply. The highest figures for nitrates occur in the winter when the surface runoff is probably slight. The chlorine figures are rather high for an unpolluted water in this region and are variable, indicating variation in the intensity of the pollution to which these high figures might be attributed. The numbers of bacteria per cubic centimeter are usually higher than are considered desirable in a potable water but these high numbers may be caused to a certain extent by multiplication in transit. The occasional presence of organisms of the B. coli type indicates some contamination from animal or human wastes. The fact, however, that these organisms occur, with one exception, in the 10 cubic centimeter inoculations only, indicates that the contamination is comparatively small. These results together with the facts obtained from the inspection of the watershed, lead to the opinion that the contamination is derived chiefly from surface wash from manured fields, from pasture land and from wash from barnyards, rather than from human sources.

As far as could be learned no typhoid has occurred on the watershed of this supply. According to information received from Health Officer L. A. Van Wagner, M. D., but five cases of typhoid have occurred in Sherburne since 1908, two in 1909, and three in 1913. In the opinion of the health officer, two of the cases in 1913 received the infection away from the village while the third case was due to contact infection. A few cases occurred in different localities in the township outside the village and on account of the large amount of milk shipped from this section to New York city, the health authorities of that city made a careful investigation in respect to the possibilty of infection of the milk sent to New York.

From a consideration of the facts as set forth above the following conclusions may be reached:

1. That the public water supply of Sherburne is ordinarily of fair sanitary quality but subject at times to small amounts of active contamination due probably to surface wash from manured fields, pasture land and barnyards.
2. That at certain times of the year growths of algae give rise to objectionable tastes and odors, but these odors are chiefly objectionable from the esthetic standpoint.
3. That the chief points where contamination from human sources might occur are the two farms located about ¼ mile above the upper reservoir on the cross road.
4. That the large storage capacity of the reservoir tends to minimize the effect of any pollution which might reach the waters of the brook, but that this storage cannot be relied upon to furnish sufficient purification at times of heavy rains.

ANALYTICAL DATA OF WATER SUPPLIES

Abbreviations used to describe odors of water: 0, none; 1, very faint; 2, faint; 3, distinct; 4, decided; 5, strong; 6, very strong; a, aromatic; d, disagreeable; e, earthy; f, fishy; g, grassy; m, musty; v, vegetable

Municipality	County	Source	Date of collection	Physical				Chemical (Parts per Million)											Bacteriological			
						Odor		Solids			Nitrogen as —						Hardness			B. Coli Type + = present — = absent		
				Color	Turbidity	Cold	Hot	Total	Loss on ignition	Mineral residue	Free ammonia	Albuminoid ammonia	Nitrites	Nitrates	Oxygen consumed	Chlorine	Total	Alkalinity	Bacteria per c.c.	10 c.c.	1 c.c.	1-10 c.c.
Sherburne.....	Chenango.....	Drinking fountain, public supply..........	3/24/08	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	650	—	—	—
Sherburne.....	Chenango.....	Drinking fountain, public supply..........	3/24/08	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2,300	+	—	—
Sherburne.....	Chenango.....	Drinking fountain, public supply..........	5/18/08	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2,500	+	—	—
Sherburne.....	Chenango.....	Tap, public supply.........	3/25/09	3	3	....	....	45	15	30	.008	.066	.002	0.50	1.70	1.50	16.9	15.0	....	....	....	....
Sherburne.....	Chenango.....	Tap, public supply.........	4/26/09	3	5	....	....	46	19	27	.016	.104	.003	0.40	2.30	1.25	24.7	13.0	220	—	—	—
Sherburne.....	Chenango.....	Tap, public supply.........	7/12/09	6	1	....	....	57	17	40	.002	.118	.001	0.40	1.80	0.75	28.6	28.5	950	+	—	—
Sherburne.....	Chenango.....	Tap, public supply.........	1/19/11	10	5	....	....	70	18	52	.006	.028	.003	0.60	1.30	1.50	41.6	30.0	....	....	....	....
Sherburne.....	Chenango.....	Tap, public supply.........	2/18/11	10	3	....	....	73	21	52	.010	.044	.001	0.80	1.70	2.50	39.0	21.0	170	+	—	—
Sherburne.....	Chenango.....	Tap, public supply.........	3/28/11	Tr.	Cl.	....	....	56	13	43	.008	.036	.001	0.50	0.90	2.50	32.5	20.0	37,000	—	—	—
Sherburne.....	Chenango.....	Tap, public supply.........	6/14/11	10	Tr.	....	....	54	20	34	.008	.050	.001	0.02	2.10	2.00	32.5	28.0	2,500	—	—	—
Sherburne.....	Chenango.....	Tap, public supply.........	10/16/11	10	5	....	....	68	14	54	.022	.094	.001	0.04	1.00	3.12	50.0	47.0	1,500	—	—	—
Sherburne.....	Chenango.....	Tap, public supply.........	2/17/12	5	2	....	....	53	26	27	.012	.056	.001	0.72	1.40	2.25	26.0	26.0	250	—	—	—
Sherburne.....	Chenango.....	Tap, public supply.........	3/28/12	5	Tr.	....	....	56	14	42	.004	.042	Tr.	0.68	1.30	1.75	26.0	20.0	10,500	+	—	—
Sherburne.....	Chenango.....	Tap, public supply.........	5/ 3/12	15	10	....	....	55	17	38	.008	.088	Tr.	0.26	1.70	1.50	22.1	16.0	190	+	—	—
Sherburne.....	Chenango.....	Tap, public supply.........	10/24/12	10	3	....	....	62	10	52	.014	.086	Tr.	0.40	1.60	1.75	36.4	29.0	200	+	—	—
Sherburne.....	Chenango.....	Tap, public supply.........	12/ 5/12	10	Cl.	....	....	41	10	31	.010	.072	.001	0.20	3.00	2.50	27.3	18.0	3,700	+	—	—
Sherburne.....	Chenango.....	Tap, public supply.........	1/13/13	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	4,800	2+1—	1+2—	0+3—
Sherburne.....	Chenango.....	Tap, public supply.........	2/11/13	5	15	2 a.	2 a.	62	....	....	.012	.082	Tr.	0.36	1.90	1.75	26.0	15.0	800	0+3—	0+3—	0+3—
Sherburne.....	Chenango.....	Tap, public supply.........	3/25/13	20	12	2 a.	2 a.	70	....	....	.022	.130	.001	0.26	2.10	2.00	22.1	16.0	1,300	2+1—	0+3—	0+3—
Sherburne.....	Chenango.....	Tap, public supply.........	5/ 5/13	8	Tr.	1 v.	1 v.	47	....	....	.012	.066	Tr.	0.08	1.70	0.87	24.7	17.0	8,000	0+3—	0+3—	0+3—
Sherburne.....	Chenango.....	Tap, public supply.........	6/24/13	10	2	2 a.	2 a.	58	....	....	.012	.102	.001	0.06	1.20	0.62	31.2	28.0	14,000	0+3—	0+3—	0+3—
Sherburne.....	Chenango.....	Tap, public supply.........	3/ 4/14	7	Tr.	1 v.	1 v.	56	17	39	.028	.044	.003	0.80	1.60	2.25	31.2	17.0	275	0+3—	0+3—	0+3—

5. That there is some danger of contamination of the supply by workmen at times when trees are planted on the land owned by the village.

6. That there is no evidence to connect the water supply with the causation of the cases of typhoid in the village in 1913, but, on the contrary, the information given by Dr. VanWagner points strongly to out-of-town and contact infection.

In view of the above conclusions, I beg to present the following recommendations:

1. That in case of recurrence of algae growths in the reservoirs, the village authorities apply copper sulphate to the reservoirs in the proportions noted in this report.
2. That every precaution should be taken to prevent surface wash from reaching the brook from the two farms above mentioned.
3. That every care be taken to prevent contamination of the supply by workmen when engaged in planting trees on the watershed near the upper reservoir.
4. That the village authorities request every householder upon the watershed to report at once any case of infectious disease in his family to the health officer so that proper precautions may be taken to prevent any water home infection reaching the water supply.

ALBANY, N. Y., *March* 27, 1914

Copies of the above report were transmitted to the local board of water commissioners and to Dr. L. A. VanWagner, health officer.

SOUTH OTSELIC

An inspection of the public water supply of South Otselic was made on July 15, 1914.

South Otselic is an unincorporated village located in the town of Otselic in the northwestern part of Chenango county. The nearest railroad station is Cincinnatus, the terminal of a branch of the D., L. & W. R. R. from Cortland. The village is in the centre of a farming district and with the exception of one factory is mainly residential. The village has no public system of sewers but is served by privies, cesspools and one or two private sewers.

The waterworks are owned and operated by the B. F. Gladding & Son fishline manufacturers and were originally installed to furnish water power for their factory, but several houses, the schoolhouse and the hotel in the village have been allowed to connect with the main leading from the reservoir to the factory. The supply is obtained by gravity from a reservoir about ½ mile east of the village, formed by a masonry dam across a small stream. This reservoir is about 150 feet long, 50 feet wide and 15 feet deep and has a roughly estimated capacity of 500,000 gallons. About 100 persons are supplied with the water or about one-third the population of the village. The water consumption is unknown as there are no meters of any kind and no gaugings have been made. The water mains are approximately one mile in total length and are from 4 to 12 inches in diameter. There are in all 18 or 20 service taps and a few hydrants for fire protection.

The inspection of this water supply was made by Mr. E. S. Chase, assistant engineer in this Department, following the receipt of complaints relative to the quality of this water supply, and at the request of Dr. A. T. Perkins, health officer of the town of Otselic. The assistant engineer was accompanied and aided on this inspection by Dr. Perkins.

The watershed area above the reservoir is 2 square miles. The stream rises in a fairly level upland, flows through a small pond, known as the upper reservoir, near its source, and then through a narrowing valley until for about a mile above the reservoir it flows through a narrow ravine with precipitous slopes. Except at the head of the stream, where it flows through a level and swampy area, the fall of the stream is rapid and the runoff at times of rainfall takes place very quickly. About one-half the watershed is wooded and the remainder is cleared land used for farming and grazing. The soil is disintegrated shale and hardpan overlying a substrata of shale.

There are in all six permanent dwellings with accompanying outbuildings located upon the watershed and the resident population is estimated at about 25 persons or 13 per square mile. With one exception these dwellings are located fairly well away from the stream. This exception is near the head of the stream just below the pond known as the upper reservoir. This house is located upon the bank of the stream and the privy is directly on the edge of a steep slope which drains towards the stream not over 50 feet distant. At times of rainfall, it is evident that wash from the privy would reach the stream in a very short time.

In addition to the permanent dwellings upon this watershed there are 3 or 4 abandoned lumber shacks located about one-half mile above the reservoir. These shacks have been abandoned since the first part of the present year, but previously had been used during lumbering operations in the vicinity. Last fall a case of typhoid occurred in one of these shacks. This shack was located within a few feet of the stream on the slope towards the stream. It is claimed that every precaution was taken in the disinfection and burial of excreta but the location of the building was such that, even with the most extraordinary precaution, a serious danger to the water supply existed.

During the early part of the present year, three cases of typhoid occurred in South Otselic in one family. It is probable that two of these cases were of secondary origin and there is insufficient evidence to connect the water supply with the other although the coincident occurrence of typhoid on the watershed is significant but not conclusive.

In addition to possible contamination from the various dwellings and lumber shacks considerable contamination takes place from road wash at times of rainfall. The highway follows the brook closely for one or two miles above the reservoir and every rain washes considerable quantities of contaminating material into the stream and reservoir. This causes the water to be muddy a good deal of the time and consequently, it is claimed, very few of the people use the water for drinking or culinary purposes but use it almost wholly for flush tanks, hot water boilers and other similar purposes. .In winter the water is said to be very clear for part of the time and it is possible that when it is clear it is used for drinking. It is said, however, that the greatest amount of drinking water is derived from the wells in the village and it seems probable that in the thickly built up community the sanitary conditions of these wells cannot be above suspicion.

The results of recent analyses of the public water supply made by the Division of Laboratories and Research are given in the accompanying table. These analyses show clearly the unsatisfactory quality of the water at the time the samples were taken. While the results of the single chemical analysis do not indicate the occurrence of marked pollution the bacteriological results are far from satisfactory, due to the presence of extremely large numbers of bacteria and the occurrence of organisms of the B. coli type in quantities of sample as small as one-tenth c.c. Organismsm of the B. Coli type are usually indicative of contamination due to animal or human wastes or both and in the present case it would appear that there is opportunity for contamination from both sources, although the chief source is probably wash from the highway and pasture land.

Although it is claimed that the unsuitability of the water supply for drinking purposes and culinary purposes is recognized by the people of the village, it is decidedly undesirable to have supplied a water of such poor quality and at times, possibly, unsafe.

In view of the conclusions set forth above, I beg to submit the following recommendations:

1. That the B. F. Gladding Company be advised to either improve the present supply by building a reservoir far enough up stream to avoid contamination from highway wash, by removing the privy at the place

noted in this report to a safe distance and abating all other sources of contamination which may exist, or in case this proves impracticable seek some other supply from a safe and adequate source.

2. That pending the improvement to the system the people be advised to boil all water used for drinking or culinary purposes.

ALBANY, N. Y., *August* 8, 1914

REPORT OF WATER ANALYSIS FOR SOUTH OTSELIC

Laboratory No.					
Source	Upper reservoir or pond	Stream	Lower reservoir	Tap in village	Tap in village
Collected on	5—7—14	5—7—14	5—7—14	5—7—14	7—15—14
Color	....	....	....	....	18
Turbidity	....	....	....	....	3
Odor, cold	....	....	....	....	2a
Odor, hot	....	....	....	....	2a
Solids, total	....	....	....	....	52
Loss on ignition	....	....	....	....	17
Mineral residue	....	....	....	....	35
Ammonia, free	....	....	....	....	.004
Ammonia, albuminoid	....	....	....	....	.040
Nitrites	....	....	....	....	.002
Nitrates	....	....	....	....	0.20
Oxygen consumed	....	....	....	....	4.90
Chlorine	....	....	....	....	0.63
Hardness, total	....	....	....	....	19.5
Alkalinity	....	....	....	....	17.0
Bacteria per c.c.	130	20,000	23,000	21,000	18,000
B. coli type 10 c.c.	3+0—	3+0—	3+0—	3+0—	3+0—
B. coli type 1 c.c.	2+1—	2+1—	3+0—	3+0—	2+1—
B. coli type 1/10 c.c.	0+3—	1+2—	0+3—	1+2—	2+1—

Results are expressed in parts per million. + Present. — Absent.

Abbreviations used to describe odors of water: 0, none; 1, very faint; 2, faint; 3, distinct; 4, decided; 5, strong; 6, very strong; a, aromatic; d, disagreeable; e, earthy; f, fishy; g, grassy; m, musty; v, vegetable.

Copies of the above report were transmitted to the B. F. Gladding & Son Company and to Dr. A. T. Perkins, health officer.

WILMINGTON

An inspection of the public water supply of Wilmington, N. Y., was made on June 12, 1914.

Wilmington is an unincorporated village of about 100 inhabitants located in the northern part of Essex county, 30 miles southwest of the city of Plattsburg. Au Sable Forks, the southern terminus of the Au Sable branch of the D. & H. R. R., is 10 miles distant by highway. The village has no industries, being located in a farming, lumbering and summer resort district. During the summer months the population is nearly doubled by transient visitors. The village has no public sewer system but is served by outside closets, cesspools and one or two private sewers.

A water district has been formed in the township including about 26 houses or nearly the total number of houses in the village. This water district is bonded for the cost of the water system which was constructed in 1904 by contract. The survey for this water district and water works system was made by Mr. John McCloud, surveyor. An elective board of water commissioners controls the operation of the water supply. At present the board consists of Messrs. Benjamin Elliott, C. W. Cooper and Albert Wilkins, Jr.

The water supply is derived from a mountain brook about one mile west of the village, on the opposite side of the west branch of the Au Sable river.

This brook is formed by the confluence of 3 smaller brooks known as White, Red and Stevenson brooks respectively. The intake is about one-quarter of a mile below the junction of the three brooks. A low masonry dam has been thrown across the main brook forming a shallow pool from which a 4-inch intake pipe conveys the water by gravity to a small distributing reservoir about 75 feet further down the stream. This reservoir is of masonry about 12 x 12 x 6 feet with a capacity of approximately 5,500 gallons and covered by a wooden roof. The intake behind the small dam is located about 15 feet from shore in a depth of water of about one foot. This intake consists of a 4-inch cast-iron tee which is protected in no way from debris and other matters which may be washed down the stream. This intake pipe enters the reservoir at the bottom and a 3-inch main to the village leaves from about the center of the reservoir just above the bottom. The intake end of the main to the village is protected by a perforated tin cone which acts as a strainer, the perforations being about ⅛ of an inch in diameter. The inflowing water exceeds the consumption in the village and an overflow trough carries the excess back into the stream, thus giving a constant circulation of water in the reservoir.

From the reservoir the water is distributed by gravity to the village through about 1¼ miles of cast-iron mains ranging in size from 1¼ to 3 inches in diameter. There are in all about 25 service taps, none of which are metered, and 3 fire hydrants. No data are available as to the water consumption and pressure in the mains. No men are employed to look after the system but whatever work is required is attended to by the commissioners. The reservoir has to be cleaned out very frequently, especially after heavy rains, and the mains are flushed often in summer.

The inspection was made by Mr. E. S. Chase, assistant engineer in this Department, following the receipt of information from Dr. J. A. Smith of Saranac Lake, sanitary supervisor of district No. 1, in respect to insanitary conditions upon this watershed. The assistant engineer was accompanied and aided by Mr. Benjamin Elliott, water commissioner.

The total watershed above the intake is 4.5 square miles. The watersheds of the White, Red and Stevenson brooks above the point of confluence are 1.9, 1.4 and 1.1 square miles respectively. All these brooks rise on the sides of the mountains west of Wilmington and flow down precipitous courses to their junction, thence into the west branch of the Au Sable river at a point opposite the village. The three watersheds are covered with second growth timber of spruce, birch, pine, etc., the soil is scanty sand and gravel overlying a substrata of granite and the slopes are very abrupt. The beds of the brooks are gravel and boulders.

White brook rises on the northern slope of Whiteface mountain and flows through an absolutely unpopulated area crossed only by a mountain trail and a short stretch of wood road. Red brook rises in a hemlock swamp in a hollow between the mountains and flows through a territory which, with the exception of one house, is also unpopulated. The house is located a considerable distance from the stream and contains but one inhabitant. The highway also crosses this watershed but is located well away from the stream. Stevenson brook rises at the foot of a cliff of the mountain and flows through an area which, with the exception of 2 or 3 houses just above the junction of the brooks, is also unpopulated. White brook is said to become greatly swollen at times of heavy rainfall and the water becomes very turbid. The waters of Red brook have a brownish color due to its rise in a swamp. Stevenson brook is said to be largely spring fed and to be less affected by rainfall.

While the conditions of the branch brooks above dwellings are excellent and are about the same in each case in respect to sanitary features, the conditions below the houses and within ½ mile of the intake are decidedly unsatisfactory. Conditions at and around these houses are such as not only to form a constant menace to the sanitary quality of the water but to bring about almost continuous pollution of the stream. While the drainage from these places would reach the brook in an exceedingly short time during rain fall a list of the points at which insanitary conditions are particularly follows:

The place owned by Mrs. Avery used in summer as a boarding hou which may have at times as many as 20 occupants, has a newly const cesspool about 30 feet from the brook. This cesspool is 6 x 8 x 10 fee and is built of stone laid up dry. The soil is sand and coarse Previous to the construction of this cesspool the house was served privy, recently destroyed, located directly on the edge of the brook. winter months this house is not occupied.

At the Leander Wilkins place near the junction of the brooks the is located within 15 feet of the edge of the stream and drainage can reach the brook at this point. The sink drain from the house flows d through a tile pipe into the brook. A barn, barnyard and pig pen are on the edge of the brook and manure and other refuse is scattered al bank.

At the Will Mayhill place the privy is located about 15 feet from th of a small intermittent brook which drains into the main brook a fe dred feet distant.

At the Carl Lawrence place the privy is about 75 feet from the and at this point a watering place for stock is maintained in the broo

At the Roland Marshall place a pigpen is located almost directly bank of the stream.

All of the above places are distributed along the brook within 1/ of the intake and none of them now are over two hundred feet distan the stream. The total number of houses is eight and the permanent tion residing in them is thirty-one.

At the time of the inspection a sample of the village water was tak the results of the analyses made by the Division of Laboratories and Re expressed in parts per million are as follows:

REPORT OF WATER ANALYSIS FOR WILMINGTON

Laboratory No.		..
Source		..
Collected on		..
Color		
Turbidity		
Odor, cold		
Odor, hot		
Solids, total		
Loss on ignition		
Mineral residue		
Ammonia, free		
Ammonia, albuminoid		
Nitrites		
Nitrates		
Oxygen consumed		
Chlorine		
Hardness, total		
Alkalinity		
Bacteria per c.c.		
B. coli type	10 c.c.	
	1 c.c.	
	1/10 c.c.	

Results are expressed in parts per million. + Present. — Absent.

Abbreviations used to describe odors of water: 0, none; 1, very faint; 2, faint; 3, di decided; 5, strong; 6, very strong; a, aromatic; d, disagreeable; e, earthy; f, fishy; g, g musty; v, vegetable.

The results of these analyses show a water of fairly satisfactory q from the physical standpoint and the low figures for nitrogen in its v forms indicate small amounts of decomposing organic matter. The fig chlorine is somewhat higher than is normal in unpolluted waters o vicinity and the bacterial results show the effect of the various sou pollution described above and indicate the presence of active contami

The total numbers of bacteria are rather high and the presence of organisms of the B. coli type in inoculations as small as 1 c.c. confirms the occurrence of contamination from animal or human sources. It is evident that the amount of polluting material is small compared with the flow of the stream, thus bringing about little effect upon the chemical constituents of the water although the more delicate bacterial tests show this pollution.

In view of the above facts the following conclusions may be drawn:

1. That a serious condition of affairs exists on the watershed of the water supply of Wilmington due to the decidedly insanitary conditions present within a very short distance of the intake. These conditions are particularly dangerous on account of their close proximity to the intake and the rapidity with which contamination may reach the water supply.
2. That any one of the three brooks if taken from a point above the houses would afford a reasonably safe and satisfactory supply from a sanitary point of view.
3. That Stevenson brook if taken at a point above any possible contamination would in all probability afford a safe and the most satisfactory supply, although the selection of any stream would depend upon a full knowledge of local conditions.

In view of the above conclusions I beg to make the following recommendations:

1. That the water commissioners abandon at once the present intake and secure a water supply from some point on any of the three brooks above possible contamination.
2. That pending the extension of the intake, which should be carried out immediately, the inhabitants of the village be advised to boil all water used for drinking and culinary purposes.
3. That in view of the engineering difficulties connected with developing a water supply in this region due to rapid runoff, large flood flows, and need for a proper dam, the board of water commissioners employ a competent sanitary engineer to advise more fully as to the best point at which to locate the new intake and the best methods of construction and design of such an intake.

ALBANY, N. Y., *July* 2, 1914

Copies of the above report were transmitted to the local board of water commissioners and to Dr. J. D. Smith, health officer.

REINSPECTION OF PUBLIC WATER SUPPLIES BY SANITARY SUPERVISORS

During the past six years the engineering division has made careful investigations of about 170 of the public water supplies of the State along the lines indicated previously. In order to determine the more recent conditions of these supplies and whether the recommendations embodied in the reports have been carried out the sanitary supervisors have been requested to reinspect and report upon the supplies in their districts which have been inspected in the past by this division.

Upon the receipt of each report from a supervisor the facts are carefully reviewed and studied in the light of what was previously reported, especially with reference to the recommendations previously made and those subsequently carried out. The engineering division then prepares a supplementary report calling attention to any failure or omission to carry out the previous recommendations, and possibly making additional recommendations. This supplementary report is then sent to the proper local officials with a letter urging immediate action upon such recommendations.

Owing to the fact that these reinspections were requested somewhat late in the year, some 24 inspections only have been made by the sanitary supervisors.

The municipalities at which the public water supplies have been reinspected by the sanitary supervisors during 1914 are given in the following list: Amsterdam, Ausable Forks, Avoca, Champlain, Hammondsport, Haverstraw, Hillburn, Jay, Lake Placid, Larchmount, Owego, Plattsburg, Port Jervis, Poughkeepsie, Prattsburg, Richmondville, Rouses Point, Sag Harbor, St. Johnsville, Sloatsburg, Suffern, Tupper Lake, White Plains, Yonkers.

A supplementary report has been completed by the engineering division in respect to the water supply of Lake Placid and other reports are being prepared covering the remainder of the above listed supplies.

LAKE PLACID

A reinspection of the public water supply of Lake Placid was made on November 24, 1914, by Dr. John A. Smith, sanitary supervisor of District A, and the facts concerning the condition of the supply at that time are based largely upon information furnished by him.

A full investigation of this supply was previously made by the Engineering Division in August, 1911, the report of which will be found on page 738 of the Thirty-second Annual Report of this Department. Following this investigation an inspection and report was made by Prof. George C. Whipple for the Shore Owners Association of Lake Placid. The report of Prof. Whipple confirmed the findings of this Department and gave advice relative to the improvement of sanitary conditions.

The water supply of this village is derived from the southeastern part of Lake Placid about one mile north of the village through an intake 500 feet from shore. With the exception of an additional mile of water main no changes or additions have been made to the water works since 1911. The resident population is estimated at 1,700 and the summer population at upward of 6,000. The daily water consumption is estimated at 100 gallons per capita.

The attractiveness of the lake is well known and many summer camps and residences border its shores. Furthermore, it is easily accessible to the large summer population of the village itself.

In the report made in 1911, the danger of contamination of the lake by seepage or overflow from cesspools at camps located near the lake was pointed out and in July of the present year Dr. Smith made a report to this Department in respect to the insanitary condition of a cesspool at one camp and, although such contamination was not noted, the possibility of seepage into the lake from cesspools at other camps.

As was pointed out in the previous report, the village is provided with a sewer system and into this system discharge the sewers of the Whiteface Inn and the Ruisseaumont sewer districts in the town of North Elba, these districts adjoining the village on the northwest and northeast respectively In 1912 an extension was made to the Whiteface Inn sewer district in order to provide proper disposal for the sewage from some seven camps on the peninsula opposite the water works intake and at present an extension to the Ruisseaumont section of the sewer system is under construction which will care for the sewage from several camps on the east side of the lake.

The board of health of the town of North Elba in which Lake Placid is situated has established certain requirements in respect to sewage disposal at camps along the shore of the lake. These requirements are that each camp be provided with a water tight receiving cesspool of concrete from which the contents shall be pumped back to a leaching cesspool of proper size not nearer than 300 feet of the lake, situated in suitable soil and subject to the approval of the health officer. In fact the owners of one camp at which an insanitary cesspool was noted this past summer have been notified by the board of health of North Elba that the camp will not be permitted to reopen next summer until the above requirements are complied with. There are at present about 60 permanent well appointed camps on the shores of the lake and nearly all have complied with the requirements of the board of health of North Elba.

It appears, then, that with the exception of the sewer extensions referred to, conditions upon the watershed remain practically unchanged.

Three cases of typhoid occurred on the watershed three years ago, a negro domestic employed at one of the camps having defecated along one of the streams supplying the camp with water and this being followed by the three cases at this camp. It was assumed that this negro was a bacilli carrier. No other cases are known to have occurred on the watershed and no outbreaks of typhoid have ever occurred in Lake Placid.

A systematic sanitary patrol of the watershed is made monthly under the direction of the local authorities and samples of the water are submitted to this Department for analysis at about the same interval. The results of analyses made during the past three years by the Division of Laboratories and Research are given in the appended table.

These analyses show a satisfactory water from the esthetic standpoint, the color being slight, turbidity practically absent and hardness very low. The figures for nitrogen in its various forms are consistently low indicating the practical absence of any large amount of organic contamination. Chlorine, however, is present in amounts somewhat greater than the normal in this region, thereby showing the effect of the large population which, during the summer, visits the lake and its watershed. The bacterial results are fairly good, except during the summer months. During these months the total counts increase somewhat and organisms of the B. coli type become present in 10 c. c. inoculations of the samples, while during the rest of the year these organisms are absent.

The analyses of samples recently taken from three tributaries of Lake Placid which flow through certain camps are also given in the table of analyses and these results show B. coli in 10 c. c. inoculations. However, these organisms are present in no greater numbers than would be expected in surface runoff from a populated area upon which, as in the present case, there are apparently no direct sources of contamination.

Under present conditions in respect to sewage disposal, the opportunities for contamination of the lake which might affect the safety of the water supply of the village seem to be largely due to the use of the shores of the lake for summer residences and the incidental use of the lake for boating.

RESULTS OF WATER ANALYSES

Abbreviations used to describe odors of water: 0, none; 1, very faint; 2, faint; 3, distinct; 4, decided; 5, strong; 6, very strong; a, aromatic; d, disagreeable; e, earthy; f, fishy; g, grassy; m, musty; v, vegetable

Municipality	County	Source	Date of collection	PHYSICAL				CHEMICAL (PARTS PER MILLION)											BACTERIOLOGICAL			
						ODOR		SOLIDS			NITROGEN AS —						HARDNESS		Bacteria per c.c. gelatin 20° 48 hours	B. COLI TYPE + = PRESENT — = ABSENT		
				Color	Turbidity	Cold	Hot	Total	Loss on ignition	Mineral residue	Free ammonia	Albuminoid ammonia	Nitrites	Nitrates	Oxygen consumed	Chlorine	Total	Alkalinity		10 c.c.	1 c.c.	1-10 c.c.
Lake Placid	Essex	Tap, public supply	1/27/13	7	Tr.	1 v.	1 v.	21	9	12	.014	.062	Tr.	0.08	2.60	0.50	11.1	7.0	10	0+3—	0+3—	0+3—
Lake Placid	Essex	Tap, public supply	5/ 3/13	Tr.	Ce.	1 v.	1 v.	38			.002	.046	Tr.	0.06	1.90	0.25	12.7	9.0	45	0+3—	0+3—	0+3—
Lake Placid	Essex	Intake pipe, pumping station	6/ 2/13																10	0+3—	0+3—	0+3—
Lake Placid	Essex	Tap, public supply	7/ 1/13																15	0+3—	0+3—	0+3—
Lake Placid	Essex	Intake pipe, pumping station	8/17/13																55	2+1—	0+3—	0+3—
Lake Placid	Essex	Lake Placid, over intake	8/17/13																300	2+1—	0+3—	0+3—
Lake Placid	Essex	Lake Placid, over intake	9/ 3/13																70	3+0—	0+3—	0+3—
Lake Placid	Essex	Intake pipe, pumping station	9/ 3/13																70	2+1—	2+1—	0+3—
Lake Placid	Essex	Tap, public supply	9/ 3/13																20	3+0—	0+3—	0+3—
Lake Placid	Essex	Intake pipe, pumping station	9/17/13																50	0+3—	0+3—	0+3—
Lake Placid	Essex	Lake Placid, over intake	9/17/13																50	0+3—	0+3—	0+3—
Lake Placid	Essex	Lake Placid, opposite Whiteface Inn brook	9/17/13																60	3+0—	0+3—	0+3—
Lake Placid	Essex	Lake Placid, opposite McCutcheon brook	9/17/13																70	0+3—	0+3—	0+3—
Lake Placid	Essex	Lake Placid, over intake	10/15/13																25	0+3—	0+3—	0+3—
Lake Placid	Essex	Intake pipe, pumping station	10/15/13																15	0+3—	0+3—	0+3—
Lake Placid	Essex	Tap, public supply	11/22/13	12	5	1 a.	1 a.	32	15	17	.014	.062	.001	0.04	3.40	1.00	9.5	6.0	70	0+3—	0+3—	0+3—
Lake Placid	Essex	Tap, public supply	12/16/13																35	0+3—	0+3—	0+3—
Lake Placid	Essex	Lake Placid	1/27/14	2	Ce.	1 v.	2 v.	40	20	20	.022	.052	.001	0.06	3.60	0.75	12.7	7.0	5	0+3—	0+3—	0+3—
Lake Placid	Essex	Tap, public supply	1/27/14																13	0+3—	0+3—	0+3—
Lake Placid	Essex	Tap, public supply	2/22/14																14	0+3—	0+3—	0+3—
Lake Placid	Essex	Tap, public supply	2/23/14																26	0+3—	0+3—	0+3—
Lake Placid	Essex	Tap, public supply	2/23/14																130	0+3—	0+3—	0+3—

Lake Placid	Essex	Tap, public supply	3/24/14																50	0+3—	0+3—	0+3—
Lake Placid	Essex	Lake Placid	4/25/14																70	0+3—	0+3—	0+3—
Lake Placid	Essex	Lake Placid	8/12/14	Tr.	Tr.	v.	1 v.	23	10	13	.002	.016	.001	0.02	2.70	0.50	7.9	7.0	40	2+1—	0+3—	0+3—
Lake Placid	Essex	Brook, Bronson camp	11/10/14																270	2+1—	1+2—	0+3—
Lake Placid	Essex	Brook, Shaw camp	11/10/14																150	0+3—	0+3—	0+3—
Lake Placid	Essex	Brook, Prall camp	11/10/14																200	0+3—	0+3—	0+3—
Lake Placid	Essex	Tap, public supply	11/10/14																140	0+3—	0+3—	0+3—
Lake Placid	Essex	Brook, Bronson camp	11/24/14																40	2+1—	0+3—	0+3—
Lake Placid	Essex	Brook, Shaw camp	11/24/14																60	1+2—	0+3—	0+3—
Lake Placid	Essex	Brook, Prall camp	11/24/14																70	1+2—	0+3—	0+3—
Lake Placid	Essex	Intake, Lake Placid	11/24/14																20	1+2—	0+3—	0+3—
Lake Placid	Essex	Tap, public supply	11/24/14	5	Tr.	1 v.	1 v.	47	20	27	.014	.064	.001	0.02	3.80	0.38	11.1	6.0				

bathing and fishing. That contamination does occur during the summer is evidenced by the analytical results as pointed out above.

In view of the foregoing facts, the following conclusions may be drawn:

1. That the water supply of Lake Placid, although comparatively free from contamination during the winter season is, however, subject to serious contamination during the summer months due to the large number of residents along the shores of the lake and its tributaries and to the summer visitors around the lake.
2. That, although the efforts of the local authorities towards abating insanitary conditions tend to reduce the number of permanent sources of contamination, sanitary patrol alone can not be relied upon to prevent all temporary sources or acts of contamination.
3. That on account of the use of the lake for pleasure purposes such as boating, bathing and fishing, there exists the possibility of serious contamination and even infection of the water of the lake in the vicinity of the water works intake.

I would, therefore, recommend:

1. That the local authorities continue their vigorous policy of abating and controlling sources of contamination.
2. That in order to reduce the danger of contamination from both temporary and permanent sources to a minimum the village install apparatus for the sterilization of the water supply with hypochlorite of lime or liquid chlorine.

ALBANY, N. Y., *December* 21, 1914

Copies of the above report were transmitted to Dr. John A. Smith, sanitary supervisor and to Dr. M. E. Proctor, health officer.

INVESTIGATION OF COMPLAINTS RELATING TO STREAM POLLUTION

INVESTIGATION OF COMPLAINTS RELATING TO STREAM POLLUTION

Although closely associated with questions of water supply and sewage disposal, the pollution of the streams of the State must be included in a separate classification because of the different laws often involved and also because of the nature of the cases themselves which frequently involve important personal or private interests, the right of riparian ownership or the inadequacy of local ordinances.

The attention of the public has been aroused through forceful educational campaigns and directed toward the importance, from the point of view of health and comfort, of preventing the defilement of the waters of the State and therefore the Department is frequently appealed to in matters of this kind especially in those cases which because of their far-reaching influence or peculiar nature cannot be effectively handled by the local health authorities. The more important of the cases which have been investigated, reported upon and advice given to the local Boards of Health or other action taken in accordance with the provisions of the Public Health Law are listed below.

AMSTERDAM

An inspection was made of conditions of pollution in tailrace in the city of Amsterdam. On September 14, 1914, a letter was received from H. M. Hicks, M.D., city health officer, in which the matter was brought to the attention of this Department. The inspection was made on September 23, 1914, by C. A. Howland, assistant engineer, in company with Dr. Hicks.

On the northeast corner at the intersection of Market and Livingston streets in the business section of the city of Amsterdam, is situated the large manufacturing plant of the Klauder-Weldon Company. Machinery used in the dyeing of textiles is manufactured at this plant. For about eight years electric power has been used to operate the machinery of the factory but previous to this time power to operate the machinery was obtained from a 25 h. p. hydraulic turbine. Water was diverted from Chuctanunda creek to operate the turbine, the desired head being obtained by constructing a dam across the creek just above the factory and diverting the water through a flume to the turbine which is located in a masonry pit in the cellar.

In company with Mr. J. C. Evenden, foreman of the Klauder-Weldon Company, who furnished the data regarding the use of the turbine included in this report, Dr. Hicks and the engineer observed the flume at its head and inspected the turbine and turbine pit. At the time of the inspection no water was flowing through the flume and it was stated that the head gates of the flume have been opened only at infrequent intervals to flush out the tail race, in fact, the operating platform of the head gates was covered by a pile of moulding boxes.

The water from the turbine was discharged through a penstock or tailrace which passes under Livingston street and a number of lots and buildings and empties into Chuctanunda creek a short distance above East Main street, which is one of the principal business streets of the city. The tailrace, which was constructed more than 33 years ago, is built of masonry. It has a basket handle cross section approximately 4 feet wide and 4 feet in height and is roofed throughout its length. At its mouth, the bottom of the tailrace is practically flush with the bed of Chuctanunda creek, so that there is opportunity for the water of the creek to back up into it at times of high water.

In the rear of a residence occupying the southeast corner lot at Market and Livingston streets, a detached privy is situated over the tailrace. At the side of the privy is a chute apparently so arranged as to allow the discharge of refuse into the tailrace. This residence is owned by Mr. Francis Morris of the firm of A. V. Morris & Sons, proprietors of extensive knitting mills in Amsterdam and elsewhere. Mr. Morris stated, when interviewed by the engineer, that his complaint was based on the odors arising from the tailrace. He said that modern toilet facilities are installed in his house, which he occupies only a short time each year, and the house is connected with the city sewerage system. He has forbidden his men to use the outside privy, which for some time has been a sort of public comfort station, and he believes that it is still so used by workmen and others. Anyone could readily enter the privy from Livingston street at the time of the inspection.

The engineer found at the mouth of the tailrace that there was no discharge taking place through it and aside from the pollution of fecal matter from the privy above described there was no evidence of direct sewage discharge into the tailrace. As above pointed out, however, there is opportunity for the water of the creek to back up into the tailrace and since the waters of the creek are extensively polluted both by sewage and manufacturing wastes, a condition of the stream which was described in a report of an inspection made of the creek in 1907 by a representative of this Department, the subsequent stagnation of these waters in the tailrace due to the fact that there is no appreciable flow therein would readily account for the foul odor which was observed in the tailrace at the time of this inspection. This matter of odors emanating from the tailrace is, therefore, one which is closely connected with the general problem of the improvement of conditions in Chuctanunda creek.

It follows that whereas certain insanitary conditions were found to exist in the tailrace itself, conditions which are the partial cause of the odor arising from it, the conditions in the tailrace cannot be said to constitute a nuisance except as connected with the general conditions in Chuctanunda creek. These conditions should be remedied and in order to accomplish this, in addition to requiring that the privy located in the rear of the house owned by Mr. Francis Morris, be discontinued, two possible courses are available, namely: to remove the primary cause of the influence of conditions in the creek on the tailrace by eliminating the pollution from the stream, or to fill in the tailrace so as to prevent the stagnation of polluted water therein and the consequent production of odors.

The benefits to be derived by the city from carrying out the first mentioned course have been discussed at length in a report upon conditions in the creek dated August 1, 1907, and as pointed out at that time the matter is one which is closely connected with the question of sewage disposal for the city. In order to effectively prevent the pollution of the creek water which gives rise to a public nuisance of which the odors in the tailrace are only a part, an intercepting sewer should be built by the city to receive all of the sewage and manufacturing wastes which are now discharged into the creek and convey them to an adequately constructed disposal works for their treatment before discharging into the Mohawk river.

It is obvious that in regard to the second remedy above outlined, namely, the filling in of the tailrace, there are certain legal questions involved as respecting the riparian rights of the owners of the tailrace, which, although pertinent to the case, are not within the province of this Department to settle, but must rather be taken up by the local health authorities and the attorney for the board if action to improve conditions by filling in the tailrace is decided upon.

The choice of the method to be employed in abating the conditions of nuisance found to exist in this tailrace must rest with the city authorities but I would recommend that it be strongly urged upon the Board of Health that a greater benefit will accrue to the city and a more permanent and satisfactory result be obtained by constructing an intercepting sewer and disposal plant. The general condition of nuisance arising from the pollution of the Chuctanunda creek and the unsightly conditions created therein, entirely aside from the question of the danger to the public health of the city would thereby be eliminated permanently.

In conclusion I would recommend that copies of this report be transmitted to the Board of Health of the city of Amsterdam and that they be advised to at once take action along the lines pointed out in this report.

ALBANY, N. Y., *October* 9, 1914

A copy of this report was enclosed in a letter addressed to the local health authorities.

GREECE (town)

An investigation was made of insanitary conditions at certain ponds and along the shore of Lake Ontario in the town of Greece, Monroe county, extending from Manitou Point southeast as far as Charlotte, a distance of seven and one-half miles. The inspection was made on September 22 and 23 by Mr. Harrison Gunning, engineering inspector in this Department. This inspection was made in response to a complaint received at this Department regarding the insanitary practice of locating privies in this district directly over ponds and bays. West of Manitou Point are a few cottages and The Manitou Beach Hotel. Southeast of the beach is a narrow strip of beach about 100 feet wide between Braddock Bay and Lake Ontario. There are three cottages on this strip of beach having privies directly over the water of the bay. The bay is one mile long, having an outlet one-half mile wide opening to the lake.

On the strip of beach at the east side of the bay are cottages with privies directly over the water of the bay.

East of Braddock bay is Cranberry pond, one mile long, draining by a narrow outlet about 30 feet wide into Long pond, which is about two miles long, but only ¾ of a mile along the lake front.

All along the beach between Cranberry pond and the lake and between Long pond and the lake are cottages both north and south of the track, having privies over the water of the ponds.

Long pond drains into the lake by a creek about 40 feet wide running parallel with the lake shore for ¼ mile and thence northeasterly to the lake. On this creek are two privies over the water of the creek.

Buck pond is east of Long pond and is one mile long. Along the beach here are several cottages, about eighteen, which have privies over the water of the pond. Buck pond drains into the lake at the east end.

Round pond is about ¼ mile wide and there are about 25 privies directly over the water of the pond or over the water of the swamp at the edge of the pond.

A separate list of cottages with their locations, which have privies over the water of the ponds or bay, has been prepared and is submitted with this report. The list was made by starting the investigation at Manitou Point and proceeding with the inspection southeast along the beach to Charlotte.

There are approximately 110 cottages along the beach, with 77 privies over the water of Braddock bay or one of the ponds. There is ample room for privies on the land, and in most cases the privies could be built over good sand.

Regarding garbage disposal in this district, it may be stated that at all places except Cranberry pond, the general practice is to throw the garbage into the water of the ponds or Braddock bay. At Cranberry pond, a Mr. Rigney, a farmer, collects most of the garbage for his pigs.

Along the beach opposite Cranberry pond and Long pond is a good road, but from here east, along Buck pond and Round pond, there is no road. The trolley line traverses the whole length of the beach to Manitou Point. A good road for the entire length is to be constructed. When this is built all garbage could be readily collected by one collector.

Most of the cottages use lake water for drinking purposes, running pipes a short distance out into the lake. Since all the privy wastes as well as garbage wastes now discharged into the ponds and into Braddock bay eventually reach Lake Ontario, from which the water supplied for most of the cottages is derived, it is evident that these supplies are thus in serious danger of contamination and infection at all times.

The ponds and bay are used for fishing and rowing. In the late summer the water in the ponds becomes low and stagnant, sometimes the outlets from Buck pond and Round pond to the lake being cut off. In this case the accumulation garbage and privy wastes along the shore results in very decided conditions of nuisance and constitutes a distinct menace to health.

It is manifestly an unsafe practice from a public health standpoint for the cottage owners along the beach to derive their supply of potable water, unfiltered, from Lake Ontario, and this is so not only because of the pollution now reaching the lake from the practice of a majority of these cottage owners placing privies over the waters on the south side of the beach, but from the fact that considerable sewage pollution enters the lake at nearby points, to say nothing of the pollution caused by bathing and other conditions affecting a body of water which has so large a population residing near it.

In conclusion it is apparent as a result of the inspection that vigorous action should be at once instituted by the board of health of the town of Greece to require the removal from a location over any body of water of every privy in the district described, and steps should also be taken to bring about a change in the manner of supplying these cottages with a potable water.

I consider the situation to be one demanding prompt and effective action to this end, and I would recommend that a copy of this report be forwarded to the board of health of the town of Greece with a request that an abatement of the insanitary conditions existing in the town and described above be required by them.

ALBANY, N. Y., *September* 25, 1914

A letter enclosing a copy of this report was addressed to the local board of health advising them to take action to abate the insanitary conditions.

HUDSON

An investigation was made in regard to insanitary conditions due to improper sewerage in the city of Hudson and the adjoining town of Greenport, Columbia county. The inspection was made on December 29, 1913, by C. A. Howland, inspecting engineer, in company with James C. Armstrong, Jr., sanitary inspector, of Hudson. In a letter dated December 8, 1913, William D. Collins, M. D., health officer of Hudson, requested that such an inspection be made.

From a point on the new Hudson and Albany State road between the Boston and Albany railroad tracks and the tracks of the Albany Southern railroad, an interurban electric line, a short street known as Spring street extends westerly. At its junction with the State road Spring street is in the town of Greenport, while its lower part extends within the city limits of Hudson. The street, which is about 900 feet long, lies, therefore, partly in the town and partly in the city. The inspector was informed by Louis Van Hoesen, M. D., mayor of Hudson, that the street had never been accepted by the city as a city street.

Some seven houses of frame construction are located on this street and two others face on the State road near its upper end. The houses are separated by yards and all but two of them are on the northern side of the street. Two of the houses are supplied with water piped from a privately owned spring. The other houses depend for their water upon cisterns or carry it from one of the two above mentioned places. The city water mains have not been extended into this street.

None of the houses have installed flush closets but use outside privies. Practically all of them, however, have kitchen sinks and the wastes from these discharge into an 8-inch sewer laid in the middle of the street from a point near its junction with the State road. This sewer was laid probably more than 38 years ago, either by private individuals or by the city. Mr. M. J. O'Hara, city engineer, informed the inspector that there is no record to show that the sewer was put in by the city. Connections with this sewer have been made at various times, from 6 to 11 and 13 years ago.

The sewer passes down the center of the street to a point about opposite the Clough house, where it turns southwest and discharges into a ravine. This ravine begins just above the Hudson city boundary line. Just below the boundary line a storm drain discharges the storm water from the northern side of the street, where a catch basin is located. A six-inch tile pipe sewer also discharges near this point. The latter sewer comes from the Barber barn, where a grating covered opening receives drainage from the barnyard and the overflow from a water trough. The drain was put in about two years ago. A decided odor of putrescent organic wastes was apparent at the end of the 6-inch tile pipe and the bed of the ravine was black. No evidences of such wastes were found at the end of the storm drain or the 8-inch sewer laid in the street. Several houses on the street are within 100 feet of these outlets, which are on property owned by Mr. Clough. Mr. Clough stated that odors arising from these discharges are such as to constitute a nuisance.

The ravine at this point is about 15 feet deep with steep sides. Its bottom is grown up with vegetation to a considerable extent and rubbish has been thrown into it. The ravine passes northwesterly, then turning slightly more towards the north, becoming much broader and deeper in its lower part. Below the sewer outlets about 300 feet is located a spring from which water is taken for use at the Evans Ale Brewery. This spring consists of a covered receiving basin into which, the inspector was informed, a number of wooden subsurface collecting pipes lead the water from the surrounding area. Mr. Evans informed the inspector that this spring and aqueduct which carries the water to the brewery are privately owned and were put in about 1785. The water is used by some six or eight residences on State street, while at the brewery it is used for drinking purposes, in the process of brewing and for cooling. Another spring, probably not now extensively used, is also located in this part of the ravine. Below the springs a stream of water some 3 or 4 feet wide and several inches deep flows through the ravine. Above the springs the stream is less in volume, but a well defined flow of water was found at the time of the inspection.

The stream passes under the Albany Southern railroad tracks through a large tile pipe. About one-half a mile below this point the stream discharges into Underhill pond, from which it was stated ice is cut for use at the New York State Training School for Girls. The outlet of the pond discharges finally into the Hudson river.

From the above inspection it appears that wastes of a putrescible character, and which may be classed as sewage as defined under the Public Health Law, are discharged in such a manner as to not only create conditions which give rise to a public nuisance, but also seriously endanger the purity of a water supply used for potable purposes and for manufacturing. There is also danger of pollution of the ice taken from Underhill pond.

I would, therefore, recommend that copies of this report be transmitted to the boards of health of the city of Hudson and of the town of Greenport, and that they be advised to take immediate steps toward preventing the discharge of sewage and sink wastes into the above ravine and watercourse. Since it is apparently not economic at the present time to dispose of these wastes through the city sewerage system, it will be necessary to dispose of them either with individual cesspools or systems of subsurface irrigation pipes.

ALBANY, N. Y., *January* 2, 1914

Letters enclosing copies of this report were addressed to the boards of health of the city of Hudson and of the town of Greenport, advising them to take action to abate the conditions of nuisance.

LEROY

On March 2, 1914, an investigation was made at your direction of the sanitary conditions of the temporary lock-up at LeRoy, Genesee county.

The inspection was made by Mr. C. A. Holmquist, assistant engineer of the Department, in company with Dr. G. H. Davis, health officer of the village, and Mr. T. J. Kemp, a member of the board of health and board of trustees. Mr. Joseph A. Lapp, village president, was also interviewed at the time of the inspection.

The village of LeRoy, which has a population of nearly 4,000 persons, is situated near the central part of the town of LeRoy, Genesee county, and is on the Erie and the Buffalo, Rochester and Pittsburg railroads. The permanent lock-up of the village, which was a brick structure, was destroyed by fire about three years ago, and a proposition to raise sufficient funds to rebuild the lock-up along permanent lines has been repeatedly defeated when voted upon by the taxpayers since that time. The last time that the proposition was voted down was at a special election last January, and it appears that the proposition cannot be brought before the taxpayers again until after the next regular election to be held on April 7, of this year.

The present building which has, until recently, been used as a temporary lock-up, is a single story structure 30 feet wide by 35 feet long and from 9½ to 10½ feet high. The roof and three sides of the building are of wood, covered with tar paper, and the fourth side consists of the remaining brick wall of the old lock-up.

The building has two double doors in front, 8 feet by 8 feet each, and two small windows. The front window is 5 feet by 3 feet and is composed of small squares of glass. The window in the former cell room in the rear is similar to the front window, except that it is only 3 feet by 3 feet in area. Only the front portion of the building has a floor. The building is heated by three gas heaters.

The front and greater portion of the building is occupied by fire apparatus, and a small space about 10 feet by 14½ feet in area in the rear of the building is partitioned off for a cage room. This room contains one of the windows referred to above, one gas heater and two latticed steel cages, which stand directly on the bare ground. These cages are 4 feet by 7 feet by 7 feet high and contain one bunk each. In one corner of each cage is a triangular shaped metal box containing a metal pail, which was presumably used for the disposal of excretal wastes, as there are no other sanitary conveniences in the cages or building.

It was learned at the time of the inspection that the locks were removed from the cages about the first of last February and that, although tramps are allowed to spend the nights in the cages and building, no persons are detained or have been detained against their will in the cages or building since February 1 of this year. Any person now arrested is immediately brought before the justice and is either acquitted or convicted. If convicted he is sent either to the county jail at Batavia or to the penitentiary at Rochester, depending upon the offense committed, so that no person arrested is now detained in the cages.

The village president stated that this precaution would be followed until a new lock-up was secured, as the village officials do not want to be held responsible for the possible loss of life by fire or otherwise of prisoners confined in the cages, especially during the night when there are no officers on duty. The president also stated that he believed that, in view of the additional expense involved in the present method of handling prisoners, the village will soon see the need of securing a permanent lock-up, and that the proposition to raise sufficient money, some $1,500, to build such structure, plans for which have been approved by the State Commission of Prisons, will be favorably voted upon in the near future.

In conclusion I would state that it appears from the inspection that the structure used as a temporary lock-up is not only a fire trap, but is insanitary, damp, improperly ventilated and heated, devoid of sanitary conveniences and entirely unsuitable for the detention of prisoners.

ALBANY, N. Y., *April* 2, 1914

The matter of the correction of the dangerous conditions found to exist was taken up with the State Commission of Prisons in a letter inclosing a copy of the above report.

PERRY

An inspection was made in regard to the pollution of Silver lake outlet and the Genesee river by sewage from the incorporated village of Perry, Wyoming county. The inspection was made on August 29, 1914, by C. A. Howland, assistant engineer.

On August 12, 1914, a complaint was received from Mr. J. M. Hastings, an attorney of Mt. Morris, in which it was stated that evidences of the contamination of the Genesee river by sewage from the village of Perry had been observed about one-half mile below the mouth of Silver lake outlet. It was mentioned that ice is obtained from the river, above the dam at Mt. Morris.

According to the census of 1910 the village of Perry has a population of 4,388. Plans for a sewerage system for the village were approved by this Department on November 7, 1900, and subsequently plans showing amendments and extensions were approved. Of this system of sewerage practically the whole has been built, although parts of the system along the shore of Silver lake and in Alleghany road have not yet been constructed.

A large part of the sewage of the village discharges through an outlet located just outside of the southeastern corner of the corporation boundaries. The sewage emerges with considerable velocity from the mouth of a cast-iron pipe which carries it down the steep bank of the ravine through which the Silver lake outlet flows. Another outlet discharging the sewage from houses on Walnut, Handley and Park avenues is located several hundred feet below Park avenue. About 50 houses are said to be contributory to this sewer. Previously the sewage flowed down the steep bank of the outlet through a wooden box sewer but this had become damaged in such a way that the sewage escaped from the sewer at a point near the top of the bank and flowed over the ground.

Silver lake outlet is extensively used for power purposes. It appears that the flow of water is regulated by gates in a dam near the lake and that at such times as the mills are not in operation these gates are closed. Thus for 13 hours of each week day and on Sunday and other holidays the only flow through the outlet is the seepage through the dam. A m owner with whom the engineer talked estimated the flow through the outlet as 1,500 cubic feet (11,250 gallons) per minute, i. e. about 25 cubic feet per second for the eleven working hours. The flow at other times was estimated to be equal to a 2-inch flow over a dam 3 feet wide which would give a flow of about 0.7 cubic feet per second. In the fifth annual report of the State Water Supply Commission, page 320, the discharge of Silver lake outlet is estimated as 100 cubic feet per second for about 8 months with a minimum of about 40 cubic feet per second. The catchment area of Silver lake at the foot of the lake is given as 24 square miles.

From data furnished by Mr. O. N. Bolton, village clerk, it appears that the water consumption of Perry averaged 725,000 gallons per day for the year from March 1, 1913, to March 1, 1914. For another year this value was about 720,000 gallons per day. Two of the large manufacturing plants use a total of 7,771,000 gallons in 6 months in their boilers, which gives an average of about 43,172 gallons per day. Subtracting the part of the water supply which is used for steam from the total amount used a net domestic consumption of about 681,800 gallons is obtained. The infiltration of ground water would probably increase the volume of sewage discharged into the outlet to a figure greater than this amount. However, if it is assumed that 50% of the village sewage flows off in 8 hours a maximum flow of about 1.6 cubic feet per second represents the maximum discharge, while a minimum discharge of about 0.8 cubic feet per second is obtained.

A comparison of the discharge of sewage with the values for the flow in the outlet which were obtained on this inspection would indicate that the ratio of the maximum flow of sewage to the maximum stream flow is about as 1 to 15, while the ratio of minimum sewage flow to minimum stream flow is as 1 to 1, nearly. That such a comparison is correct is shown from the fact that the maximum flow of sewage occurs during the day when the maximum flow also occurs in the stream, except on Sundays and other holidays, when the minimum stream flow would prevail all day.

An examination of the above data indicates that when the water of the outlet is being utilized for power purposes the village sewage is diluted by about 15 times its volume of water but that at the times when the gates at the head of the outlet are closed the flow of sewage is probably equal to or greater than the flow of water in the outlet. There is, therefore, opportunity for an accumulation of sewage in the outlet at such times as the flow is low, which accumulations would be subsequently flushed out to a greater or less extent by the increased flow and carried to the Genesee river, where it would tend to accumulate in the slack water.

In company with P. S. Goodwin, M. D., health officer of the village of Perry, and Mr. O. N. Bolton, village clerk, the engineer drove from Perry to Mt. Morris and inspected the Silver lake outlet and Genesee river at numerous points. In these streams there is a fall of about 620 feet in the 9 miles between Perry and Mt. Morris and about 600 feet of this fall is in the Silver lake outlet between Perry and the Genesee river, a distance of about 5 miles. The bed of the outlet throughout this part is rocky and there are several falls, giving an opportunity for aeration of the sewage polluted water.

According to data contained in the New York State Museum Bulletin 85, the catchment area of the Genesee river above Mt. Morris is 1,070 square miles. This includes, of course, Silver lake and its outlet. The mean run-off from this catchment area for the eight years from 1891 to 1898, inclusive, was 1,054 cubic feet per second. The minimum monthly flow for this period occurred for September, 1895, during which month the flow averaged 100 cubic feet per second. Numerous gaugings have been made in recent years of the Genesee river, but usually at the Jones' bridge, five miles below Mt. Morris. In the fourth and fifth annual reports of the State Water Supply Commission is given data which indicates that during 1908 the minimum mean flow for any month was 161 cubic feet per second, in October. The minimum flow was 94 cubic feet per second and occurred on December 25, while on August 8, 15, 22 and 29, 1909, the flow was 82 cubic feet per second. The mean flow for the month of January, when ice would probably be cut on the river, was 1,110 cubic feet per second in 1908 and 1,540 cubic feet per second in 1909.

Mr. Hastings, the complainant, with whom the engineer talked in Mt. Morris, asserted that he had seen evidences of the pollution of the Genesee river by sewage from Perry on Monday, August 10, 1914. He had not observed the river at other times, hence he could not compare its condition on August 10 with its condition at other periods, but as the flow in Silver lake outlet would probably have been increased on a Monday after having been low for a period it would appear that conditions were favorable for the sewage to be carried to the Genesee river. At the time of the present inspection made during a period of increased flow, the evidences of pollution, such as a characteristic odor and the appearance of toilet paper, had practically disappeared before the Genesee river was reached. The odor of sanitary sewage could be faintly detected between 3 and 4 miles below Perry.

A comparison of the sewage flow of Perry with the flow in the Genesee river at Mt. Morris shows that at times of extreme low flow in the river the sewage is diluted by about 50 times its volume of water. At other times the dilution is over 900 times its volume and although the Genesee river is polluted above the mouth of the Silver lake outlet it would appear that there is a sufficient dilution to prevent a public nuisance arising in the Genesee river at this point at the present time. That the evidences of pollution have been observed in the Genesee river was asserted by a number of persons with whom the engineer talked and this inspection has shown that the manipulation of the flow in the Silver lake outlet makes this possible.

A study of the data compiled in this report in regard to the amount of sewage discharged from the sewers of the village of Perry as compared with the flow of water in the Silver lake outlet and Genesee river at different seasons and especially as compared with the flow of water in the Silver lake outlet on different days and at different periods of each day, points to the conclusion that any conditions of nuisance existing at any time in the Silver lake outlet or in the Genesee river are entirely due at the present time to the regulation of flow of water in the outlet and the consequent inability at certain periods of the water to properly dilute and carry away the sewage, followed by a time of increased flow when the sewage is diluted by a greater volume of water with the resulting greater transporting power.

In view of the considerable dilution of the Perry sewage which takes place when it reaches the Genesee river even in times of low flow in the river, it does not appear that this Department might properly defer, until a future time, action to require the village of Perry to install a sewage disposal plant to treat the sewage before its discharge into the Silver lake outlet, especially since, in view of the extensive pollution of the river above the outlet, treatment of the sewage of Perry would have only a very small effect in producing such a degree of purity in the Genesee river water that the ice cut from it above Mt. Morris could be used without danger to the health of the consumers of this ice.

However, the regulation of the flow of water in the Silver lake outlet is such as to give rise to conditions of public nuisance in the outlet and, therefore, I would recommend that the effect of the present regulations of the flow of water be pointed out to the village authorities and that they be advised that steps should be taken to so regulate the flow that sufficient water will pass through the outlet to properly dilute and flush out the sewage at all times. I would recommend further that the village authorities be advised that in the event that such steps to properly regulate the flow in the outlet are not taken, it will make the installation of a sewage disposal plant more necessary and considerably hasten the time when it will be necessary that the sewage of Perry now discharged into the Silver lake outlet should be required to be treated in a sewage disposal plant.

During the inspection it was found that the sewer outlet near Park avenue was broken in such a way that the sewage flowed over the
of the ground. I would, therefore, recommend that this outlet be

and placed in such a condition that the sewage will discharge directly into the waters of the outlet.

I would finally recommend that a copy of this report be transmitted to the authorities of the village of Perry and that they be requested to take the action outlined therein.

ALBANY, N. Y., *September* 15, 1914

A copy of this report was inclosed in a letter transmitted to the village authorities on October 21, 1914.

SODUS (town)

The following report was prepared upon the investigation of the insanitary condition of Sodus Point and the alleged contamination and pollution of Sodus bay.

In view of the many communications received by the Department from Dr. H. C. Bennett, health officer of the town of Sodus, from various members of the Sodus Bay Improvement Association and from officials of the Northern Central R. R., the investigation was ordered by you and was made in accordance with your directions by Inspecting Engineer C. S. Ell on July 30 and 31, 1914.

Complaints have been received for some time by this Department in regard to the nuisance and insanitary conditions created in Sodus Point and especially Sand Point by the dumping of garbage and refuse on vacant lots and the pollution of the waters of Sodus bay by discharging sewage and wastes into the bay. Consequently, Dr. Wm. A. Howe, former Deputy Commissioner of Health, visited Sodus Point (at the request of the Department) in August, 1911, and reported his findings to the Department under date of September 6, 1911.

The present investigation covered all places on the shores of the bay where any nuisances or sources of pollution of the waters of the bay were either apparent or thought likely to exist. This included the village of Sodus Point, Sand Point, South Shore, Resort, Lake Bluff and the islands in the bay as well as several isolated houses along the shores of the bay. On the morning of August 1 the inspecting engineer met and conferred with Dr. H. C. Bennett, health officer; Mr. W. H. Snyder, Mr. E. A. Buck and Dr. F. S. Willson, members of the Sodus Bay Improvement Association, and Mr. H. K. Tubbs, Mr. H. L. Thomas, Mr. F. D. Gray and Mr. M. M. Farrell, officials of the Northern Central R. R. The questions of the insanitary conditions created on Sand Point and the pollution of Sodus Bay were discussed. However, no suggestions or recommendations were made by the inspector and all questions as to what action the State Department would take in the matter were referred to the Department.

Sodus Point is an unincorporated village in the town of Sodus, Wayne county, having a resident population of some 600, which is increased in the summer time to some 2,000. The village is located on a point of land extending eastward some one mile from the main land, some one-half mile wide, and known as Sodus Point. It is bounded on the north by Lake Ontario and on the south by Sodus bay. It is some 50 miles west and 15 miles north of Syracuse and is the terminus of the Northern Central railroad, which extends almost the full length of Sodus Point along the shore of Sodus bay.

Sodus bay proper, on which the dwellings, stores and hotels are located, is rolling land consisting mostly of sand, sandy loam and clay. There is no public water supply or sewerage system. The water supply is taken almost entirely from shallow dug wells and wells driven through sand and clay into gravel. Very few houses are equipped with plumbing and these discharge into cesspools, the common toilet facility being the ordinary privies with or without vaults.

It was found that the Johnson House, owned by Mr. W. G. Desuter, Williamson, N. Y., Mr. Charles Burns, Alton, N. Y., and Mr. H. Williams, Sodus, N. Y., maintains a cesspool north of the house and at the end of the barn, overflowing onto the surface of the ground, emitting an offensive and foul odor and causing an insanitary condition in a small depression draining toward wells, the water of which is used for potable purposes.

It was found that the Harris House, having a capacity of some 20 guests, and of which house Mr. James Harris, Sodus Point, N. Y., is the owner and proprietor, has installed plumbing fixtures to the extent of one flush closet, one urinal, one bath tub, two wash basins and one kitchen sink, all of which are said to discharge into a cesspool some 15 feet in diameter and 8 feet deep, located some 50 feet southeast of the house and constructed in clay. This cesspool was found by the proprietor to be inadequate to care for the sewage and wastes and overflowed on the ground. Consequently the original outfall sewer located in Sodus bay was resorted to and the sewage is discharged at present, either direct or after having passed through this cesspool, into Sodus bay through a discharge pipe the outlet of which is some 60 feet from the shore and under 2 feet of water. The intake for the water supply used for all purposes except drinking and cooking is also located in the bay by the side of the sewer and some 20 feet from shore and not more than 40 feet from the sewer outlet.

Sodus bay is a large body of water some five miles long and extending southeast and northwest and some two miles wide. The bay is entirely protected from Lake Ontario by a long narrow sand beach known as Crescent Beach, extending from Lake Bluff westward some 6,000 feet to Charles Point and by a breakwater extending from Charles Point westward some 1,500 feet to the channel, which is some 400 feet wide, and the only connection between the waters of Sodus bay and Lake Ontario. There is much swamp and marsh land at various points along the shore of the bay, the surrounding country is in general rolling with gentle slopes and in the bay are three islands, commonly known as Bute island, Islay island and Arran island. It was found that the Northern Central R. R. cut annually some 15,000 tons of ice from the bay. Also that for the last four years some 6 to 8 barrels of oil have been put on the waters in the bay and marshes each spring to prevent the propagation of mosquitoes.

Sand Point is a part of Sodus Point and is a narrow projection of flat sand and muck land some 200 to 500 feet wide and extending some 3,000 feet southeast from Sodus Point proper, from near the eastern end of Sodus Point and near the Lake Shore station of the Northern Central R. R. It is a comparatively flat or level strip of land, none of which is more than 2 to 3 feet above the water of the bay at the present time and the larger part of which is entirely submerged in times of extreme high water and a part of which is under water every spring.

Sand Point is primarily a summer resort. There is only one street on Sand Point. This is Greig street, which extends the entire length of the point near the north side. For the first 600 feet from the main land Greig street is near the water's edge, and in this same distance and located on the north side of the street, constructed entirely over the water are practically all of the candy stands, ice cream stands, restaurants, picture galleries and dance halls on the beach. From this point some 600 feet from the main land to the end of Sand Point Greig street is more removed from the north shore leaving ample room for cottage lots between the street and the water, most of which have been built upon, except the lots near the end of the point, where there are very few cottages.

On the south side of Greig street for some 2,000 feet from the main land the point is almost entirely marsh land, with a few stores, boarding houses and cottages constructed on made land. This area which is not built upon is covered with a dense growth of cat tails some six feet high. There is one area between Greig street and the south shore some 1,000 feet long which is one large marsh covered with a dense growth of seaweeds and cat tails.

The water supply for nearly all the business places, boarding houses and cottages on Sand Point for drinking and cooking is taken from a few driven wells on the point and in many cases it is carried long distances. The source for all other purposes is usually taken from the bay. Only one case is found where water for drinking and cooking was taken directly from the bay.

There are few flush closets on the point and these apparently discharge into cesspools. The common toilet is the ordinary privy with or without a vault or equipped with pails. The contents of the privies when cleaned are buried on the point, taken away by scavengers, dumped into the bay or taken out of the bay and dumped into Lake Ontario.

It was found that in the majority of cases garbage, refuse and rubbish were either thrown into the waters of the bay or into the marshes on Sand Point, creating in either case foul, offensive and insanitary conditions. Several places were found in the marshes where the inhabitants had formed regular dumps for garbage, refuse and rubbish, which were not only unsightly and insanitary but were a decided nuisance and injurious to public health.

However, it was found that Mr. F. W. Raymer collected the garbage on Monday and Friday of each week from some 20 cottages at the rate of 25 cents per week per cottage and carted same to a farm about one mile south of Sodus Point and one-half mile from the waters of Sodus bay, where it was dumped on the ground and plowed under. Mr. Raymer expressed his willingness to take garbage from all the restaurants, boarding houses and cottages and also clean and keep clean all privies at the same rate per week per cottage as received for disposing of garbage.

It was found that practically all of the business places on Sand Point maintain privies and kitchen sinks over the water and discharge all excreta and waste directly into the waters of the bay. The following summer resorts were also found to maintain insanitary conditions:

1. The Emery House, of which Mr. William B. Lepper, Sodus Point, N. Y., is the owner and proprietor, maintains two privies, one kitchen sink and one wash basin, all located over the bay and discharging directly into the waters. It was also stated by the proprietor that he has a man take his garbage out into the bay and dump it overboard.
2. The Doviel Hotel, of which Capt. Joseph Doviel is proprietor, is located over the water of Sodus bay and discharges all excreta and wastes from two flush closets, four wash basins, one bath tub and one kitchen sink directly into the waters of the bay.
3. The Ontario House, owned by Mr. F. D. Gaylord, Sodus, N. Y., dumps all garbage and refuse into marsh at side of house and discharges all kitchen waste and slop directly into marsh.
4. The Walsh House, owned by Mr. Walter Walsh and of which Mr. G. B. Ochs, Lyons, N. Y., is proprietor, maintains a surface privy at the edge of a small stagnant pool which is cut off from the waters of the bay by a small timber breakwater some two feet high. The privy is open around the bottom and it is evident that the excreta must at least occasionally be washed out into the bay. Much rubbish and refuse is also thrown into this pool.

It was ascertained that on Sand Point alone there were some 16 privies, 6 wash basins, 8 kitchen sinks and one bath tub maintained directly over the bay and so located that all excreta and wastes drop directly into the waters of the bay. It was also found that in addition to throwing all garbage and refuse into the marshes some properties used the marshes as a disposal ground for all slop and waste water.

At various points around the bay ordinary surface privies were found to be maintained in the edge of the marshes near the waters of the bay and so constructed that the contents must evidently, occasionally, at least, be washed out into the bay. It was also found that the three summer houses on Islay island discharged by means of independent outfall sewers all excreta and wastes directly into the waters of the bay.

It has been ascertained that if the privies are equipped with pails or a vault with a convenient means of cleaning same and that if all garbage and refuse be kept separately in cans or pails, that it will be removed frequently and regularly by a responsible party for a reasonable charge and disposed of in a safe and sanitary manner.

It appears, therefore, that garbage, refuse and rubbish are frequently dumped into the marshes and vacant lots on Sand Point by the cottage owners and residents, causing unsightly and insanitary conditions. It is evident, further, that much sewage, garbage and refuse and wastes are discharged directly into the bay, contaminating and polluting the waters of the bay, rendering them, occasionally at least, foul and offensive and a menace to public health. It is apparent also that there are no grounds, methods or means of disposing of sewage, garbage, refuse and wastes on the limited projection of land known as Sand Point and that such must be disposed of elsewhere.

It appears that since the town has a population of less than 10,000 the town authorities cannot contract for garbage disposal nor compel a location for a garbage disposal plant, so that the whole proposition is one of individual responsibility. It does not seem that the expense would warrant the establishing of a sewer district and the necessary disposal works by the town. Here again it is a case of the individual responsibility of each property owner to dispose of all excreta in a safe and satisfactory manner. It would seem then that probably the only satisfactory method of disposing of garbage and excreta would be to induce the property owners to keep these separate and have the same collected regularly by scavengers and disposed of in a suitable and satisfactory manner so that no insanitary conditions will result.

I would therefore recommend that the local Board of Health be especially urged to take the matter up as one of their duties under the Public Health Law, to investigate all insanitary conditions and all cases of pollution of the bay and to take such action within their powers and jurisdiction as will eliminate the further occurrence of any nuisance on Sodus Point and prevent the discharge of all sewage and wastes into the waters of Sodus bay. I would further recommend that a copy of this report be sent to both the local Board of Health and to the Sodus Bay Improvement Association, urging upon both the exertion of their influence and powers to induce all individual property owners to provide suitable and proper means for the collection and disposal of sewage, garbage and refuse in a safe and satisfactory manner.

It is apparent that there is a strong spirit of cooperation between the activities of the local Board of Health, the railroad officials and the Sodus Bay Improvement Association toward a general movement to better the sanitary conditions on Sodus Point and particularly Sand Point, and steps are being taken at present to have large signs painted and posted on the marshes to prevent the dumping of garbage and refuse thereon. I believe that if this procedure be carried out, and that if the present dumps and piles of garbage and refuse be removed and further disposal of garbage, refuse and wastes in the marshes be prevented by the local Board of Health, that the present insanitary conditions resulting therefrom will be eliminated.

ALBANY, N. Y., *August* 24, 1914

Copies of this report were inclosed in letters addressed to the Board of Health of the town of Sodus and to the Sodus Bay Improvement Association recommending that steps be taken to eliminate the insanitary conditions.

WESTFIELD

The following report was prepared on an inspection made in regard to the pollution of a stream in the village and town of Westfield, Chautauqua county, by wastes from a grape juice manufacturing plant owned by Armour & Company of Chicago. The inspection was made on May 6, 1914, by C. A. Howland, sanitary inspecting engineer, as the result of complaints made to this Department by residents of the village.

The Armour grape juice plant occupies the northwestern corner formed by the intersection of the N. Y., C. and St. L. R. R. and Franklin street in the northern part of the village. In 1899 the Chautauqua Fruit and Grape Company established a grape juice manufacturing plant in the location now occupied by Armour & Company. Later the Fenner Grape Juice Company acquired the property which was bought by Armour & Company in September, 1910. The inspector was informed that the business has increased considerably since that time, but that the character of the wastes has become less offensive because material which was previously wasted is now utilized.

The plant, of which Mr. J. M. Culver is superintendent, is devoted entirely to the preparation and bottling of grape juice. At the time of the inspection, the wastes consisted principally of wash water from 5-gallon carboys and from floors and machines. In the pressing season, to the above wastes are added wash water from press cloths and bottles.

The water supply, which is obtained from the village mains, is metered. Two of the readings made by the company every six months were given to the inspector as follows:

Dec. 1. 1912–June 1, 1913	4,681,000 gals.
June 1, 1913–Dec. 1, 1913	4,837,000 gals.

Part of this water is used for boiler purposes and some is used in flush closets and wash basins and otherwise disposed of, but it is probable that the discharge of wastes would average close to 30,000 gallons per day.

The sewage from flush closets and from wash basins used by 30–35 persons at the present time, and by about 100 persons in the pressing season, is discharged into the village sewerage system at a manhole in Franklin street just north of the N. Y., C. and St. L. R. R. tracks.

The wastes from the manufacturing processes discharge into a watercourse between 100 and 200 feet north of the L. S. and M. S. R. R. tracks. This is apparently the head water of this stream, which is a well-defined watercourse flowing northward into Lake Erie. Drains which are said to discharge cellar drainage from a hotel, wastes from wash basins in the railroad station, surface water and waste from a hydrant are connected with the drain from the Armour plant at a manhole and drop inlet.

A wooden channel and weir are located at the point of discharge. These were used by the company in experiments made to determine the practicability of treating the wastes with hypochlorite of lime. Mr. Culver said that the color could be removed by this means. At present the superintendent is sinking a well casing with strainer end in the sloping ground north of the plant. He explained that he intends to pass the wastes through a rotary belt screen, after which they are to be pumped into the casing. The casing is to be sunk some 40–50 feet through gravelly strata overlying the slate of the region. As far as could be learned there are no nearby wells which would be endangered by this pumping of the wastes into the ground water.

In company with Mr. Culver, the inspector followed the stream throughout its course to Lake Erie. The wastes as they issue from the 24-inch tile pipe are purple in color. At the time of the inspection the wastes did not contain any perceptible amounts of solids and no deposits of organic matters, such as seeds, stems or pulp, were found in or near the stream. The bed of the stream, however, was colored black and was coated with a deposit of black muck. In two places the stream flows through lengths of tile pipe, but the greatest part is an open watercourse, one to two feet wide and about six inches deep. The stream flows with a medium velocity, there being a fall of about 130 feet in its length of about 1 mile. Fifteen feet of this fall is over a bluff into the lake. The region through which the stream flows is devoted to agriculture, and cattle have access to the water. Some parts of the stream are in a ravine with steep sides. At one point where the stream enters a tile pipe under Nicholas avenue the grating covering the opening had become clogged, backing up the wastes. This had previously occurred at this point and also at the Furman place, where the stream passes through a culvert.

At the time of the inspection, although the wastes had the acid grape odor, this was not apparent at nearby houses. A number of houses are within 200-300 feet of the stream, among them those of the complainants, and several are within 100 feet of the stream, while a cottage near the lake is within 25 feet. It would appear that under conditions of reduced flow an odor might arise from accumulations of putrescible organic matter deposited by the wastes. The bed of the stream had been cleaned out a short time before the inspection.

The inspector called at the Smith and Furman places and found that both complainants were away from home. At the Smith place he talked with the father of the complainant. He was able to examine the conditions along the stream at both places.

From the above inspection it appears that, as the volume of wastes discharged from the grape juice plant of Armour & Company has been materially increased since 1903, and also as no records are found in this Department to show that a report of such discharge was filed as required by section 76 of the Public Health Law or a permit issued, this constitutes a violation of the above law. Also the pollution of this watercourse by putrescible organic wastes affects its use for agricultural purposes, and it would also appear that under certain conditions a public nuisance would be created.

Moreover, Armour & Company are apparently making an effort to dispose of the wastes from the grape juice plant otherwise than by discharging them into the above watercourse. If the method which they have adopted is successful, the direct pollution of the stream will cease. I would, therefore, recommend that the local board of health be informed of the results of this inspection, and that they be advised to hold the matter in abeyance for a reasonable time to allow Armour & Company to complete their disposal plant. I would recommend further that the local board of health be advised to take steps under the Public Health Law to stop the above violation if the pollution of the watercourses is not discontinued within a reasonable time.

ALBANY, N. Y., *May* 19, 1914

Copies of this report were inclosed in letters addressed to the local board of health, to Armour & Company at Westfield, and to the complainant.

In addition to the foregoing, inspections were made and reports transmitted to the local authorities or advice was given through correspondence in cases of stream pollution at the following places:

Adams Center, Amherst, Baldwin, Ballston Lake, Batavia, Bethlehem, Bowens Corners, Brocton, Catskill, Cold Spring Harbor, Cooperstown, Deerpark, East Hampton, Eden, Elizabethtown, Ellenville, Ellicott, Elmira, Elmira Heights, Frankfort, Freemont, Freeville, Glens Falls, Hopkinton, Indian Lake, Ithaca, Jeffersonville, LeRoy, Lockport, Newfane, Nile, Nyack, Oyster Bay, Pawling, Plattsburg, Port Chester, Poughkeepsie, Red Hook, Rensselaer, Richville, Ripley, Rochester, Rossie, Salamanca, Schodack, Staten Island, Unionville, Walton, Watertown, Waterville, Wawarsing, Webb, Westfield, White Plains, Wolcott, Yonkers.

INVESTIGATION OF PUBLIC NUISANCES NOT ARISING FROM STREAM POLLUTION

INVESTIGATION OF PUBLIC NUISANCES NOT ARISING FROM STREAM POLLUTION

Under the provisions of the State laws full power is given to the local Board of Health of the several civic divisions of the State to investigate and abate public nuisances which occur within the municipality over which they have jurisdiction. Many of the nuisances which arise are caused by improper drainage conditions, inadequate sewerage facilities or improper disposal of garbage and refuse or the emanation of obnoxious odor, fumes or gases from manufacturing or business establishments.

There frequently arise, nuisances, where because of the widespread influence of the case or for other reason appeal is made to this Department and in such cases advice is given in regard to the proper action to be taken in the matter or where necessary, a careful investigation is made by a representative of the Engineering Division and every effort is made to further the satisfactory abatement of the nuisance.

The municipalities where nuisances in this class have arisen are in the more important instances given below while a list is appended of all other nuisances in which action was taken by the Engineering Division during 1914.

FULTON

The following report was submitted on the alleged insanitary conditions of certain abandoned portions of the old Oswego canal in the city of Fulton.

This line of the Oswego canal passes through the city of Fulton along and close to the easterly bank of the Oswego river. The line of the new Barge canal parallels closely the old line, crossing it in places, but lies generally to the west of and between it and the river. When the construction of the new canal was undertaken the old canal was kept open to traffic for a time, but as the new construction proceeded it was necessary to close permanently the old canal, which has now been entirely abandoned and sections of which have been filled in with excavated material from the new canal prism.

There remain within the city limits, however, certain sections of the old abandoned canal which have not been filled in. Owing to the very slight gradient of these canal sections and to obstructions in the nature of dumped materials from the exacavation of the new canal and other sources, these abandoned sections of the old canal remain now partially filled with stagnant water polluted with indiscriminate surface drainage and wastes, giving rise to conditions which it is alleged are a public nuisance and menace to health of the people of the city.

A careful inspection of the conditions along the sections of the old canal complained of was made by me in company with the mayor and other city officials on March 8, 1914. It appears from the inspection that there are two sections of the old canal within the city which were not filled in after being abandoned for canal purposes, and the insanitary conditions of which were made the basis of complaint: one, in the southerly portion of the city, south of Old Guard lock, No. 3, opposite Lyon street, and lying between Yelverton island and South First street; the other in northerly portion of the city just west of Wall street and running north from Oneida street. The conditions surrounding these two sections of the old canal prism will be taken up and described separately.

Considering, first, the Yelverton island section, it was found that the portion of the old canal prism, which remains unfilled, extends for a distance of some 800 feet from Old Guard lock No. 3 south to a point at the southerly end of the island, where the new Barge canal crosses from the island to the main land. On the west side is the "Island" so called, which formerly comprised a small peninsula lying between the old canal and Oswego river, and which has been used as a spoil bank for excavated material from the new Barge canal. On the east side lies the residential portion of the city along South First street, which runs generally parallel to the canal and some 100 feet from it. The west bank and bottom of the old canal prism is in earth, while a masonry retaining wall supports the easterly bank.

This portion of the old canal prism, which has been dammed off, as it were, at both ends by the new Barge canal construction, has created therefore a lagoon some 800 feet long, into which surface drainage flows and accumulates. As a result, an elongated stagnant pool is formed in which, during the warmer months of the year, under the action of the sun's rays, mosquitoes propagate and rank aquatic life thrives. Under such conditions there is inflicted upon the people residing in the vicinity a public nuisance due not only to an unsightly mass of floating vegetation but to offensive odors arising from decomposition and putrefaction.

Furthermore, these conditions constitute a serious menace to health. No better propagating places for malarial mosquitoes could be devised than stagnant pools of this nature. During the mosquito season, therefore, which extends throughout the greater portion of the year, the people of this section of the city are not only subjected to the nuisance of this pest but must suffer directly from any malarial infection arising from it. Nor, in this connection, should we overlook the fact that offensive odors or other objectionable conditions and discomforts affect the vital resistance of individuals and that the conditions surrounding this pool are unmistakably such as to leave their traces upon individuals who may be thus affected.

Turning now to the conditions surrounding the other section of the old canal referred to, it was found that this section is situated in a more densely populated portion of the city and extends for a distance of some 1,400 feet north from Oneida street. Although the old prism has been filled in generally south of the bridge at Oneida street the portion lying north of the bridge has not been filled in. It includes old locks Nos. 9 and 10 and the short sections of canal prisms between and extending from them. The bed of these canal sections is in earth, while the sides are supported largely by masonry retaining walls.

The conditions which were found along this portion of the old canal were equally as bad, if not worse, than those found along the Yelverton Island section. This section is approximately twice as long as the one at Yelverton Island and in places the depth below the surrounding ground is much deeper and, although the water which accumulates and stands in the bed of the canal may not be so deep, its general sanitary conditions are from other causes, and, in certain respects, worse. Thus it was found that a few surface water drains lead into this old canal bed carrying into it not only the objectionable washings from streets but in some cases even domestic sewage, which, in many old cities like Fulton, seems to frequently find its way into these storm drains usually from surreptitious sources. What seems to be of equal if not more significance is that despite reasonable precautions and police patrol on the part of the city authorities, a considerable amount of refuse and waste matters, which in some cases contain garbage and other organic matter, is thrown into and along the bed of the canal. This refuse material has accumulated in such amount and manner as to seriously obstruct the flow of the surface water which is discharged intermittenly into the canal, or the flow of ground water which seeps continuously into the canal from the bottom and sides.

The result is that we have here the same general class of objectionable and dangerous conditions, only aggravated in some respects, as exist at the Yelverton Island section. It is true that the depth of water is not so great, but nevertheless a sufficient amount of it accumulates to form a succession of pools and swampy areas which contain a relatively larger amount of organic matters in the form of street washings, sewage and refuse. These pools, even though smaller, must under the intensified conditions referred to, make this whole stretch of old canal bed a source of nuisance and menace to health and as objectionable and serious as the section of old canal at Yelverton Island.

With reference to the question of abatement or improvement of the sanitary condition of these old abandoned canal sections, I looked carefully into the question of correction by means of draining and by filling in the canal prisms. It was found that effective drainage under existing conditions would be difficult from an engineering standpoint. Even if practicable such drainage would remove only a part of the objectionable conditions which now exist, especially in the section north of Oneida street, where, in general, the sanitary conditions are in some respects worse than they are at Yelverton Island. Indeed, I was convinced that the only satisfactory means of a lasting nature by which the objectionable conditions along these two sections of canal can be remedied is by completely filling them in.

Summarizing briefly then, I am of the opinion, based upon inspections and the considerations above set forth, that these abandoned and unfilled sections of the old Oswego canal in the city of Fulton constitute an objectionable public nuisance and a menace to health of residents of the city; that the only practicable and lasting means of abatement is by completely filling in the canal prism; and that the estimated cost for doing this filling, based upon figures of the canal and local authorities is not only reasonable but commensurate with the benefits to be gained.

I recommend, therefore, that steps be taken at once by the proper state or city authorities to secure the necessary funds and to execute the work of filling in these old canal prisms in order that this public nuisance and menace to health may be removed before the approaching summer season.

ALBANY, N. Y., *March* 10, 1914

GRANVILLE

An investigation was made of the gas plant of the Granville Electric and Gas Company, Granville, Washington county, N. Y.

On May 27, 1914, Mr. Horton and Mr. Cleveland of the Engineering Division, visited Granville and met Mr. Whedon, attorney and complainant, the president of the village, and the health officer, and made an inspection of the plant. This plant was previously inspected in April, 1913, and since that time has been inspected on one or two occasions. The present inspection was made at the request of Mr. Whedon, who was of the opinion that the conditions resulting from the operations carried on at the plant were still not satisfactory.

On arriving at Granville, before going directly to the plant, Mr. Horton walked along the main street on the east side of the railroad tracks in order to observe any odor that might be coming from the plant at this time, the wind being a gentle westerly wind which would carry the gas, smoke and fumes from the plant across the street referred to. This street is some

400 or 500 feet away from the gas plant. The plant was then visited and inspected very carefully by Mr. Horton and Mr. Cleveland and during their visit to the plant conditions in and about the plant were observed. Gas was being manufactured at the time and everything was in full operation, even to the blowing off of the generator and the ignition of the residual gas by means of the pilot light which had been installed during the past year.

Although Mr. Horton very carefully observed the conditions outside of the plant both at a distance and near the plant he did not detect any objectionable smoke, fumes or gas as he walked along the roadway in the line of the direction of wind from the plant. On approaching the plant and in its vicinity no objectionable odors were noticed except right inside of the building and even here the odors did not seem to be excessive, i. e., more than would be expected in an ordinary plant fairly well operated.

Apparently every requirement listed in Mr. Horton's report of April 4, 1913, had been fulfilled and, while residual gas was being burned by means of the pilot light which had been installed, there appeared to be neither objectionable smoke, fumes nor gas emanating from the plant in amounts that were detectable at any appreciable distance from the plant. In fact, the plant appeared to be operated in a manner with minimum objectionable features at the time of this inspection. Within 100 or 200 feet of the plant a marked odor, characteristic of these plants, was noticeable, but this odor was neither objectionable nor was it very marked at a greater distance away.

Near the plant and around the gas holder, as would be expected, the ground was more or less saturated with light oils, but not to an extent that created any objectionable conditions at a distance.

A very undesirable and objectionable condition was, however, observed during this visit and this was the discharge of the lighter oils from the surface of the oil and tar pit in the main room into the creek. It was found that the tar and heavy oils, which have a tendency to settle, are properly taken care of by being pumped into a tar tank from which the tar is withdrawn from time to time and sold. These lighter oils, however, appear to be discharged directly into the stream without passing through any tank and, furthermore, the discharge pipe was in the side of the embankment along the stream, so that the discharge flowed upon and spread over the embankment before entering the stream. The result was to cause an appreciable odor right near the discharge point of sufficient strength to possibly account for most of the odors noticeable within the distance referred to above around the plant; and, secondly, an objectionable condition in the stream due to the discharge of these black tarry oils which discolor the water of the stream for some considerable distance below the plant.

It is obvious, therefore, that the plant is not being operated in a strictly sanitary condition in so far as that wastes are being discharged into a stream in violation of the Public Health Law and of the Conservation Law and of the Penal Code. Furthermore, this discharge, taking place under the conditions which were found, namely, near the top of the embankment where it spreads out over the ground and gives opportunity for emanation of gaseous odors, constitutes a nuisance.

In conclusion, therefore, it is apparent from the present inspection that whereas, the Granville Electric and Gas Company, with all reasonable completeness, has carried out the recommendations of this Department as made in my report to you of April 4, 1913, one undesirable condition still remains to be abated, namely, the discharge of untreated light oils from the plant into the stream under the conditions which were found as described above. It is very probable that this could be largely eliminated by the installation of a proper tank, with a submerged trap outlet, which would permit of a settling of the heavy oils and the rising of the top oils so that the clarified effluent near the center of the tank may be discharged into the stream; and by extending the discharge pipe out into the stream near its bed, where the outlet will be below the water surface and in the main current of the stream.

I therefore recommend that the Granville Electric and Gas Company be required to abate the insanitary conditions found at the plant with reference to the discharge of these lighter oils and the nuisance arising therefrom, and that a copy of this report be sent to the local Board of Health instructing them to take such action as may be necessary in the premises to cause the Granville Electric and Gas Company to install the necessary tank or tanks and otherwise to effectively abate the conditions which were found to exist.

ALBANY, N. Y., *June* 20, 1914

A copy of this report was inclosed in a letter addressed to the local Board of Health urging them to take action to abate the undesirable conditions found to exist.

HOOSICK FALLS

The following report was prepared on an investigation made of conditions of nuisance existing in the incorporated village of Hoosick Falls, Rensselaer county. The investigation, which was made on October 29, 1914, by Mr. C. A. Howland, assistant engineer, was undertaken at the suggestion of Dr. Otto R. Eichel, sanitary district supervisor, to whom complaint in the matter had been made by persons affected by the nuisance.

The engineer conferred with Dr. F. J. Cahill, village health officer, who informed him that odors which appeared in the cellars of buildings on Main street and on the streets in the vicinity of John street had been the cause of complaints for a number of years. In company with Mr. John Redmond, superintendent of streets of Hoosick Falls, the engineer visited the cellar of the five and ten cent store owned by C. C. Allen Company. At the time of the inspection no obnoxious odors were noticed in any part of this cellar, although the engineer was informed that obnoxious odors had been detected at times and that these odors had been attributed to leaky illuminating gas pipes. The odor of illuminating gas could be detected at the cellar gas jets, which were turned off. As the furnace stands in the front part of the cellar it would appear that a considerable escape of gas at any time might result in a disastrous explosion.

Mr. Redmond informed the engineer that the sanitary sewer connection of an adjoining hotel became clogged and the sewage backed up into a storm sewer catch basin located at the curb in front of the Allen store, causing obnoxious odors. While these conditions may account for odors in the cellar of this store it was observed that the gas piping was in need of repair. This repairing should be done at once in order to safeguard the health and possibly the lives of persons in the building.

A visit was made to the cellar of the Jones, Parsons & Company store on the corner of John and Main streets. The characteristic odor of illuminating gas was detected in the front or Main street end of the cellar. Two service pipes for gas enter the building, one from John street and the other from Main street. As electricity is used in the building gas was cut off and the meter had been removed. The holes by which the service pipes pass through the cellar walls were too large for the pipes. The engineer detected the odor of gas at these points. Mr. O. C. Jones, manager of the store, informed the engineer that the odor, which is more marked in winter, has caused headaches among the employes of the store. The sanitary sewer connections for the building are in another part of the cellar and connect with sewers in Classic street. It was said that no obnoxious odors had been noticed near the soil pipe.

In a general inspection made of the surrounding streets, the characteristic odor of illuminating gas was not found in nearby sewers, although one of the tees of the gas mains is located in a storm sewer manhole.

The street immediately in front of the Jones, Parsons & Company store is brick laid on a concrete base and the sidewalks are concrete. These street surfaces are practically impervious and, therefore, gas leaking under them, unable to pass through, would spread to the sides and follow the service pipes into the buildings. The fact that the gas has not appeared in the cellars of all the buildings on both sides of the street may be accounted for by the fact that the leak is probably comparatively small or may be in the service pipe itself and also because the gas main is laid much closer to the west (Jones, Brown & Company) side of the street.

Coal gas is manufactured and supplied to the village of Hoosick Falls by the Fidelity Gas Company, of which Mr. Joseph A. Duffy of Jersey City is president. Mr. E. A. Collins is superintendent at Hoosick Falls. The number of users is 400, of which 350 have registering meters, while the others prepay. There are about 6.75 miles of mains, part of which are cast-iron pipe with lead or cement joints, and part of which are wrought iron screw pipe. A pressure ranging from a maximum of 2.8 inches of water (0.1 pound per square inch) to a minimum of 2.2 inches of water (0.08 pound per square inch) is maintained. The annual sales approximate 8,500,000 cubic feet of gas, the maximum day's output being about 30,000 cubic feet and the total gas holder capacity 31,500 cubic feet.

Mr. Collins informed the engineer that the system had not been provided with a station meter since 1912 and that, therefore, he does not know the amount of daily production of gas at this time. In October, 1912, the total monthly production was 629,200 cubic feet, there being on hand 27,165 cubic feet at the beginning of the month. The total consumption was 631,095 cubic feet. This gives a total leakage of 25,270 cubic feet in the distributing system during the month, while in August of the same year the leakage obtained by the same computation is 38,318 cubic feet. The average daily leakage is probably close to 1,000 cubic feet or about 3% of the daily production. Mr. Collins has found and repaired four leaks in the gas mains. About two years ago he drove holes close to the curb both on the John street and Main street sides of the Jones, Parsons & Company store and found gas on the Main street side, but no further steps have been taken by the company.

The data gathered during this inspection indicated that the odor noticed in the cellar of the Jones, Parsons & Company store was that of illuminating gas, which was escaping either from leaky service pipes or from the street mains themselves. The escape of gas into the cellar of a building exposes the occupants not only to the danger of asphyxiation, but also to the danger of loss of life through an explosion, while the escape of illuminating gas upon the streets through storm water catch basins, which are not trapped, or in some other manner gives rise to obnoxious odors. Therefore, as the conditions constitute a public nuisance as defined by the Penal Code, steps should immediately be taken to abate the conditions of public nuisance.

Full power and authority is given to the local Board of Health under Sections 21, 26, 31 and 32 of the Public Health Law to abate public nuisances. I would, therefore, recommend that the Board of Health of Hoosick Falls be advised to take action at once as provided in the Public Health Law to require the nuisance to be abated and the further escape of illuminating or other gas into the cellars of buildings or upon the streets of the village to be prevented.

During the inspection it appeared that odors not associated with the presence of illuminating gas, which had been noticed about the streets and in the cellars, may have resulted from clogging or other improper conditions in the village sewers and I would, therefore, recommend also that the village authorities be advised to use continued vigilance in preventing the occurrence of such conditions.

I would finally recommend that copies of this report be transmitted to the Board of Health of the village of Hoosick Falls and that they be advised to take immediate action along the lines pointed out in the report.

ALBANY, N. Y., *November* 9, 1914

A copy of this report was inclosed in a letter addressed to the local Board of Health referring the matter to them for action along the lines recommended in the report.

MECHANICVILLE

An inspection was made in response to a complaint by the Mechanicville Knitting Company regarding an alleged nuisance due to a refuse dump in the village of Mechanicville, Saratoga county. The inspection was made on May 1, 1914, by C. A. Howland, inspecting engineer, in company with Frederick A. Palmer, M. D., village health officer.

The records of this Department show that on October 11, 1907, a petition was received from residents of Mechanicville complaining of the nuisance caused by the dumping of garbage by the village authorities on a lot on Williams street. After correspondence with the health officer the president of the board of health was advised to prohibit the dumping of garbage or refuse which might create a nuisance on the premises in question.

An inspection of conditions surrounding a public dump in the southern part of the village was also made by a representative of this Department on June 12, 1912. In the report submitted upon this inspection the improper means of collecting and disposing of the garbage and refuse in the village were pointed out and the steps which should be taken by the village authorities to correct the conditions were outlined.

The dump in regard to which the recent complaint was made is situated on the western bank of Anthony Kill (Tenandaho creek) near the northern corner formed by the intersection of Viall avenue and the Fitchburg division of the Boston and Maine railroad. Ashes, rubbish and garbage had been used as filling material along the bank of the creek. On one side the refuse slopes steeply into the waters of the stream, which at the time of the inspection was some 10–15 feet wide and flowed with a considerable volume. Sawdust and shavings from a planing mill on Viall avenue or discharged into this dump, but apparently no garbage, ashes or rubbish had recently been disposed of there.

Mr. A. L. Strong, vice-president of the Mechanicville Knitting Company, informed the inspector that when refuse is dumped there the manner of disposal is such that under certain conditions a nuisance would arise. The dump is about 75 feet from the building in which the 100 employes of the company work, while the nearest houses on Viall avenue are about 200 feet distant.

Anthony Kill (Tenandaho creek) below the dump flows through the village of Mechanicville. It is dammed just above the point where it passes under Main street. Therefore refuse dumped into it above would be carried through the village and accumulate in the slack water near one of the principal streets of the town.

The engineer learned from Dr. Palmer and from Mr. Greene, village president, that the garbage and other refuse of the village is all collected by a contractor who is paid by the village to do the work. Even if separated at the houses the refuse is all collected in one wagon, so that both ashes and garbage reach the dump together. A public dump is leased by the village for dumping, and dumping is also allowed at such other places as the board of health may designate. Such dumping at places other than the public dump, in order to fill in low lying property or for other reasons such as shortness of haul, it was stated is allowed only in winter.

The records of this Department show that the method and manner of garbage and refuse disposal in use has been the cause of complaint in the village of Mechanicville for a number of years. In the report dated June 15, 1912, the proper steps to be taken by the village were described. That the recommendations of the Department have not been fully carried out is obvious from the present inspection.

It would seem advisable, therefore, that the recommendations of the report dated June 15, 1912, be again brought to the attention of the village authorities and that they be again advised to take the steps outlined in that report.

At the time of the present inspection, it could not be said that the dump on Viall avenue, near the Mechanicville Knitting Company's plant, gave rise to a public nuisance. As previously stated no refuse had been dumped there for several weeks. It is apparent, however, that if dumping is continued at this place, a public nuisance will arise.

I would, therefore, recommend that the board of health of Mechanicville be advised to prohibit further dumping on the above dump on Viall avenue, and further that they do not permit the dumping of refuse containing putrescible matter on any property so located that a public nuisance is created either at the time of dumping or subsequently.

ALBANY, N. Y., *May* 4, 1914

Copies of this report were inclosed in letters addressed to the local board of health and to the Mechanicville Knitting Co. and the board of health were advised to carry out the recommendations of the report.

MEDINA

The following report was prepared upon an inspection made with reference to insanitary conditions in two abandoned canal feeders in the incorporated village of Medina, Orleans county. The inspection was made at the request of the village authorities on July 29, 1914, by C. A. Howland, assistant engineer in the Department, in company with George F. Rogan, M. D., health officer of Medina.

Just west of the point where Oak Orchard creek crosses the western boundary of the village, a dam has been built across the creek. This dam forms a pond and diverts water into a power canal or raceway which, together with the dam, has existed for a long period of years. The power canal passes through the village, and on inspection of its channel the engineer found that a number of privies are located upon its banks and considerable rubbish has been thrown into it. After passing under East Center street, the canal flows through the mill of S. E. Blood & Co. Just below the mill, two channels have been constructed, passing north under East Center street, and which formerly connected with the Erie canal. The main raceway discharges into the Barge canal spillway at a point where it overflows into Oak Orchard creek.

One of the channels passing north from the main power canal is provided with head gates, which were closed at the time of the inspection, but which leaked considerably. The other channel has no gates. These two channels for convenience in describing them will be called the east and west channels respectively, the eastern channel being the one having head gates.

This eastern channel is in the nature of a ravine, in which considerable water was found at the time of the inspection, as well as accumulations of garbage, refuse and other filth. It passes through a large masonry culvert under East Center street, where sewage and two storm water inlets discharge into it and drops steeply to the Barge canal. The accumulation of rubbish and garbage were especially noticeable along its course from the stores on East Center street. An odor arose from it.

The western channel also passes under East Center street parallel to the easterly channel and thence to the Barge canal, near which it converges with the first mentioned one. Garbage and refuse indicated that this channel is also used as a convenient dumping ground for wastes of many kinds. As far as could be found, no sewage or storm water discharges into it directly. An old mill, no longer used, stands near its lower end, and a head race would indicate that at one time power was derived from the western channel for the mill. A trunk line of the village sewerage system crosses the outlet of the channels and the embankment on which this sewer is at present raised acts as a dam across the outlet of the channels. Daniel Heron, State patrolman, Section 10 of the Barge canal, who accompanied the engineer on this part of his inspection, informed him that the concrete wall of the canal on this side, which is now only partially completed, will be extended in an unbroken line, thus further cutting off all means of egress for the water coming down the channels under East Center street.

Mr. J. C. Hogan, resident engineer, whom the engineer subsequently interviewed, informed him that no openings will be provided in the above Barge canal wall. Material will be filled in back of the wall for 16 feet and then graded off on a 1 or 1½ slope to its intersection with the original ground surface. At the heads of the two channels under East Center street are to be constructed permanent tight head gates or a wall, thus preventing water from the power canal passing down the two channels. There appears to be little doubt that these channels were used as a feeder for the Erie canal, but Mr. Hogan, during his investigation of the matter, has not yet been able to establish the ownership of the two channels.

From the above inspection, it appears that due to the dumping of refuse and garbage into these two abandoned channels, together with the discharge of sewage and stagnation of water which now finds its way into them, insanitary conditions are created and odors arise which may be said to constitute a public nuisance affecting a large number of persons. It is apparent that to prevent the dumping of refuse of all kinds in the channels and to keep them well drained and in a clean condition would prevent conditions of nuisance, but it is also apparent that it would be difficult to provide proper drainage due to the fact that the outlet of the channels will be cut off by the Barge canal wall. Another and probably more effective method would be to completely fill in the two channels. The sewage and storm water which now discharges into them could otherwise be disposed of, as the village sewers are available in East Center street. Mr. Hogan informed the engineer that material will be available which might be used to fill in the channels, when the excavations are resumed to clean the canal prism, and that the two channels would provide a more convenient place for spoiling at least part of this material than the areas which have been set aside for such spoiling.

It is evident from the results of the inspection that a condition of nuisance exists in the canal feeders which have been abandoned, and that steps should be taken to abate this nuisance as soon as possible. It may be possible under contract between the State Department of Public Works and the contractor who has the contract for canal construction at this point to provide for the filling in of these basins, or some other arrangement may be made to attain the desired end.

I would suggest, therefore, that a copy of this report be forwarded to the village authorities, and that they be advised to take up with the State Superintendent of Public Works the question of arranging for the filling in of the abandoned feeders.

ALBANY, N. Y., *August* 6, 1914

A copy of this report was inclosed in a letter addressed to the local board of health and subsequently the Department was informed that the matter of the abatement of the existing conditions had been taken up with the State Superintendent of Public Works.

POTTER (town)

The following report was submitted on the inspection of the conditions of the Flint Creek swamp between Potter and Gorham, in Yates and Ontario counties, made at your direction and at the request of Hon. Thomas B. Wilson of Hall, N. Y.

Flint creek is tributary to Canandaigua outlet, and rises in the northern part of Steuben county at an elevation of about 2,000 feet above the sea level. It flows in a northerly direction for a distance of about 39 miles and discharges into Canandaigua outlet at Phelps. The stream has an average fall of about 40 feet per mile in this distance. The upper portion of the stream above Potter has the steepest slope, averaging 73 feet per mile for a distance of about 15 miles. Between Potter and Gorham, a distance of about 8.5 miles, the stream flows through a flat, swampy area, the fall of which is very slight. Below Potter the average fall of the stream is about 26 feet per mile.

The swamp between Potter and Gorham, which is the only swamp of any considerable size along the stream, varies in width from ½ to 1½ miles and covers an area of about 3,500 acres of which 750 are in Ontario county and the remainder in Yates county. The swamp is largely grown over with underbrush and a second growth of timber. The soil in the swamp is a black humus and muck said to be from 8 to 10 feet deep.

The inspection of the swamp was made by Mr. C. A. Holmquist, assistant engineer of the Department, in company with Hon. Thomas B. Wilson, Senator of the forty-second district, and Dr. A. B. Allen of Gorham, on June 26, 1914. The health officer of the town of Potter and a number of property owners living along the swamp were interviewed.

It would appear from the inspection that the swamp is caused largely if not wholly by a mill dam and a ledge of rock across Flint creek at Gorham. The mill dam is about 8 feet high and provides water power for a grist mill. It is formed by fastening planks to the piers or supports of a bridge across the stream and is removed during times of low water when there is not sufficient water to operate the mill. A short distance above the dam is a shale ledge, the elevation of the top of which is about 2 feet below the crest of the dam, so that the water in the swamp is held back and does not drain off at times of low water. The removal of these obstructions would give the stream a fall of not less than 1 foot per mile which should be ample to drain the swamp provided the channel of the creek is straightened and improved.

The mosquitoes were very numerous in the swamp at the time of the inspection and the abundance of trees and undergrowth in the swamp appear to afford ideal conditions for the propagation of mosquitoes. Nearly all the persons interviewed and especially those who had recently settled near the swamp, complained of the prevalence of mosquitoes. Although there appear to be no cases of malaria in the vicinity of the swamp at present, it was alleged by those interviewed that there had been considerable malaria in the past and two of the persons talked to attributed their general debilitated condition to the swamp.

The only practical way to eliminate mosquitoes is to destroy their breeding places and in this case the draining of the swamp would probably be the most effective method of accomplishing this result. I am of the opinion that not only a decided improvement in the conditions affecting the public health would result from draining the swamp but that a large area of valuable land which is now nearly useless except for woodlands would be made available for agricultural purposes.

No attempt was made, however, to determine with any degree of accuracy the practicability of draining the swamp since this can be done only after a careful survey of the area has been made. It appeared, however, from the general inspection that by the removal of the dam at Gorham, by cutting a channel through the ledge across the creek at Gorham and by improving the channel of the creek through the swamp a large portion, if not all, of the swamp could be drained at a comparatively small expense.

Chapter 20 of the Laws of 1909, relating to drainage, constituting chapter 15 of the Consolidated Laws, and chapter 519 of the Laws of 1914, entitled "An act to amend the drainage laws in relation to establishing corporate, sanitary or drainage districts and defining the powers of such corporations," outline the procedure to be followed in the draining of swamps. There appears, however, to be a feeling among the property owners that the cost of draining the swamp would be excessive and would be a heavy burden if not a hardship for some of the smaller property owners along the swamp. If it is desired, therefore, to follow any other course in this case, it would be necessary to have a special act passed by the Legislature of the State.

In conclusion I would state that in my opinion the draining of the swamp of Flint creek between Potter and Gorham, if found practicable and if properly carried out, would result in a decided improvement in the conditions of public health by eliminating the breeding places for mosquitoes and thereby lessening the danger from malaria.

I would, therefore, recommend that copies of this report be sent to Hon. Thomas B. Wilson, and to the local boards of health and that they be advised of the desirability of draining the swamp and urged to cooperate in taking steps to have this improvement carried out.

ALBANY, N. Y., *July* 2, 1914

Copies of this report were enclosed in letters addressed to the local boards of health of the towns of Potter and Gorham and to other interested persons advising that steps be taken to follow out the recommendations of the report.

WESTERN (town)

The following report was prepared upon an inspection made in regard to the discharge of wastes from a hotel in the unincorporated village of North Western in the town of Western, Oneida county. The inspection was made on May 7–8, 1914, C. A. Howland, sanitary inspecting engineer.

Wauful's Hotel (half-way house), of which Chas. Wauful is proprietor, stands at the corner of the main road through the village and a short road branching toward the west. A wash basin, kitchen sink and tank in the bar are supplied with spring water piped across the Black River canal, which parallels the main road. The inspector made a thorough inspection of the hotel but did not find a flush closet. An outside privy is used.

The wastes from the wash basin and bar discharge through pipes onto the cellar floor while the kitchen sink is emptied onto rocks under the kitchen floor. The overflow from a barrel in the kitchen is piped to a barrel in the wagon shed which overflows into a barrel in the barnyard.

A channel in the cellar floor collects the wastes and discharges them into a tile pipe leading from the northwest corner of the cellar. The pipe passes westward down the road to a point near the northeastern corner of property on which is located a public school. It is claimed that the overflow from a watering trough at the corner of the roads also comes to this point. The ditch passes diagonally across the school property, turning westward behind the school privies and a number of barnyards. It subsequently turns south, passes under a road and through about ½ mile of farming country to the Mohawk river.

At the time of the inspection the bed of the upper part of the ditch was covered with deposits of black muck but this did not have the appearance of fecal matter and no other evidences of the direct pollution of the stream by fecal wastes were found. The black muck was also noticed in the cellar of the hotel. Mr. Wauful explained that a fine red silt seeps into the cellar and is the source of this black muck which he has to clean out at intervals. The barnyard of the hotel abuts the school yard on the east. A ditch has been dug so as to divert the barnyard surface water from the school yard. This ditch discharges through the ditch receiving the cellar drainage.

The inspector talked over the telephone with Dr. H. D. McFarland, health officer of the town of Western. He stated that he had made an investigation but, as he could not find that conditions placed the matter under the jurisdiction of the board of health, no action had been taken by the board.

From the above inspection it appears that sewage, as defined in section 76-a of the Public Health Law, is being discharged from Wauful's hotel into an open ditch through which it subsequently finds its way into the Mohawk river. This open ditch passing as it does through the school yard constitutes a nuisance since there is a danger that infection from persons using the hotel wash basin might reach children playing in the ditch. The ditch affords a place where rubbish accumulates and the black muck creates unsightly conditions, which under certain circumstances might give rise to obnoxious odors. These conditions may, therefore, be said to constitute a public nuisance. It also appears that since sewage is discharged in a manner injurious to the public health, the conditions also constitute a violation of section 76 of the Public Health Law.

I would, therefore, recommend that the local board of health be advised to take steps toward compelling the abatement of the conditions existing at the time of this inspection in regard to the ditch through the public school yard in the village of North Western. I would recommend further that the board of health require that the sewage from Wauful's hotel be disposed of in a manner which shall not endanger the health of the community or create a public nuisance.

ALBANY, N. Y., *May* 28, 1914

Letters enclosing copies of this report were addressed to the local board of health and to the district superintendent of schools and the board of health was advised to take action to abate the nuisance.

In addition to the foregoing, inspections were made and reports transmitted to the local authorities or advice was given to correspondents in the matter of abatement of nuisances at the following places:

Altamont
Amsterdam
Arietta
Bellport
Berlin
Bethlehem
Cambridge
Castleton
Centerport
Duanesburg
Fishkill
Freeport
Fulton
Glens Falls
Greenport
Greene
Hall
Hartland
Henrietta
Herkimer
Hudson Falls
Indian Lake
Jamestown
Johnstown
Kenmore
Lake Placid
Liberty
Lloyd
Lockport
Locust Valley
Manlius
Massena
Mechanicville
Middleburgh
Montgomery
Nassau
Newburgh
Nile
Nimrod
Niskayuna
Oneonta
Oneida
Ossining
Peekskill
Penn Yan
Potsdam
Rensselaer
Rensselaerville
Rochester
Rosendale
Round Lake
Rye
Schenectady
Sherman
South Edmeston
Springwater
Stony Point
Tuckahoe
Watervliet
West Haverstraw
White Plains
Yonkers

NIAGARA RIVER (Motor Island Channel)

The following report covers an investigation with reference to the sanitary quality of the waters of Niagara river in connection with certain dredging operations carried on by the United States government in the vicinity of Motor Island, and to the possible effect upon the water supplies of Lockport and the Tonawandas.

This investigation was brought about at the request of the "Motor Island Channel Conference", a body of representative citizens of Lockport and the awandas, organized for the purpose of considering the question at issue it was alleged by them that as a result of the government dredging and depositing of the dredged material in and near Motor Island channel, flow of Niagara river has been so modified as to possibly reduce the flow Tonawanda channel with the result that less of the purer waters of the er flow down the Tonawanda channel to these intakes referred to. It was order therefore to determine whether any appreciable changes had taken ce as a result of these dredging operations and whether the purity of the ter supplies of the Tonawandas and Lockport had been affected thereby, t, in accordance with the request of the Motor Island Channel Conference, present investigation was carried out.

An investigation of the pollution of Niagara river by the sewage of Buffalo d municipalities in this vicinity, with special reference to the water supply Niagara Falls, was undertaken in 1907. During this investigation a newhat elaborate series of analyses was made of the river at Buffalo ween the foot of Lake Erie and Niagara Falls for the purpose of showing e extent and variation of the pollution referred to and the effect of the me upon the purity of the water of the Tonawandas and Canadian channels affecting the existing and proposed water supplies of this city then under nsideration. A full report of this investigation was submitted in that year th the results of the laboratory analyses and other data showing the extent the pollution of Niagara river and setting forth the recommendations conrning the existing and proposed supply of Niagara Falls, all of which was blished in the Annual Report of the Department for 1907.

The relation of the investigation of 1907 to the present one is important sofar as the data secured in 1907 furnish a basis for comparing results th present conditions thus making it possible to show whether any appreible changes have occurred in the extent and effect of the pollution as a sult of the government dredging that has taken place since 1907 and conrning which the Motor Island Channel Conference has now asked for this vestigation. It was accordingly arranged to repeat the series of analyses ken at stations selected in 1907 and to supplement these with other stations ich would throw additional light with reference to the effect of the dredgg and filling in of the channels in the vicinity of Motor Island.

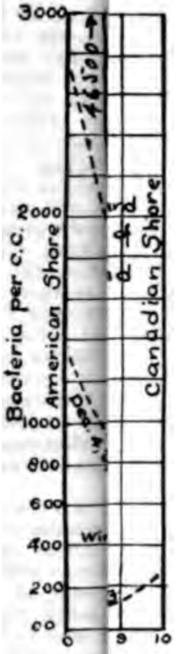
The collection of samples was made on April 29, 1913, by representatives the laboratory and engineering divisions through the aid of facilities furihed by the Motor Island Channel Conference and the samples were sent to laboratory and analyzed. The first series of samples was taken across lower end of the lake and corresponds in a general way to the series of mples collected on December 4, 1907. The second series of samples was ken across the river at the International bridge and corresponds generally, ough in more detail, to the series taken at this cross-section on November and December 4, 1907. The third series of samples was taken across the er opposite Strawberry Island, this cross-section being a new series of mples, the selection of which was for the purpose of determining the condins of pollution just above the point where dredging material had been posited by the government. The fourth series of samples was taken opposite tor Island in both the Tonawanda and the Canandian channels and corsponds to the series collected on November 3 and December 4, 1907. The th series of samples was taken across the river at a point a short distance ove the Tonawanda intake, this being a new series selected for the purpose securing a more intimate knowledge of the pollution of the Niagara river the vicinity of these intakes. The sixth series of samples was taken on a ss-section a short distance below the Lockport intake and corresponds to e series collected at this cross-section on November 3 and December 4, 07. A final series of samples was taken across the Canadian channel about posite Beaver island which is a short distance below the section above ferred to at Motor Island and was selected for the purpose of showing y change in pollution that might have occurred by the deposit of some edging material between the head of Grand Island and Beaver Island.

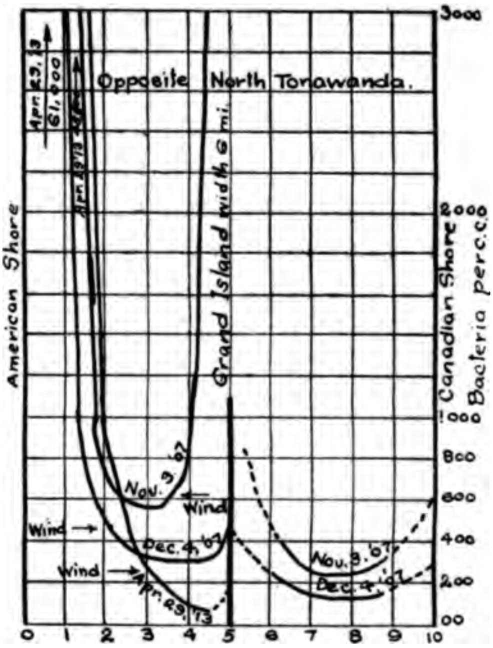
It will thus be seen that the selection of these cross-sections for collection samples of water included practically all of the sampling points of the previous investigation and a considerable number of new points for the purpose of a closer study of the pollutions that may have occurred as a result of the dredging operations. The results of the analyses are fully recorded in the tables accompanying this report embodying the results of chemical and bacteriological analyses, and upon the accompanying chart or plan showing the Niagara river, sampling stations, and the results of bacteriological analyses. Other information is also shown upon the diagram which in connection with the other data will be referred to later in the report.

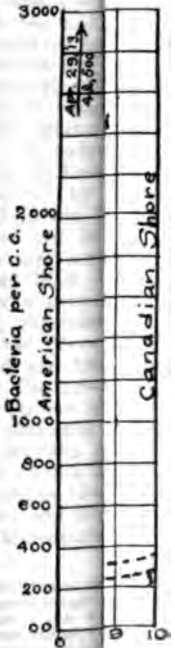
Referring now to the changes that have taken place in the hydrographic and hydraulic features of the Niagara river as a result of the operations of the government dredging it appears that the United States government, under the supervision of the corps of engineers, has performed considerable dredging along Niagara river, more particularly in a channel some 400 feet wide below the International bridge and east of Strawberry Island. The bulk of the dredged material has been deposited in an area included between Strawberry Island, Motor Island and Grand Island. These operations have been carried on during the past few years and so far as could be learned, subsequent to 1907. A portion of this area lying between Strawberry Island and at the head of Grand Island was, it is understood, years ago used as a depositing area for dredged material but only in recent years has additional material been deposited in this vicinity. Advices received through Colonel Warren of the corps of engineerss stationed at Buffalo, are to the effect, however, that the area filled in during recent years has been limited to sections where the channel has been deep and that this filling in has not extended appreciably above the general level of the river bed formerly filled in between Strawberry Island and the head of Grand Island. This filling has however raised the level of the bed of the channel between Motor Island and Grand Island sufficiently to contract the cross-section about 45%. It is estimated however that the discharge through this channel has not been reduced over 25% and that considering the small volume which formerly passed through this channel, namely, 20,000 cubic feet, this reduction does not amount to over 2½% of the total flow of the Niagara river. It is further claimed that owing to the deepening of the main channel east of Strawberry Island and Motor Island, notwithstanding this small reduction of flow which may have occurred between Motor Island and Grand Island, the amount of water passing down Tonawanda channel has been augmented rather than reduced as a result of the sum total of the dredging and filling operations carried on by the government.

It is rather difficult, in the absence of accurate hydraulic measurements before and after these dredging operations, to prove the contentions made, but according to the established principles of hydraulics, there can be little question as to the tendency claimed by the government in this matter. To begin with, even though the material has been deposited in the channel between Motor Island and Grand Island, raising the bed of the stream at this cross-section considerably, so long as its height has not been carried above the general minimum depth through the area between Strawberry Island and Grand Island, there can be very little effect on the flow passing down the Tonawanda channel from this cause. There might be a slight change in the amount of water passing between Motor Island and Grand Island and between Motor Island and the American shore but not any great change between the Canadian channel and the Tonawanda channel. Furthermore on the principle of hydraulics, if the channel between Strawberry Island and the American shore has been deepened and if some of the flow has been diverted from the channel between Motor Island and the American shore, there would be a tendency to prevent the pollution which hugs very closely the American shore from extending out into Tonawanda channel.

The pollution of Niagara river is caused primarily by the sewage discharged into the river from Buffalo and other municipalities along Niagara river and to a certain extent from the municipalities situated near the lower end of Lake Erie. The principal pollution, however, comes from the City of Buffalo which is discharged through sewers directly into the Niagara river and Buffalo creek. The other pollution referred to is relatively of so small an







N.Y. STATE DEPARTMENT OF HEALTH

CURVES SHOWING

BACTERIA PER CUBIC CENTIMETER

IN

SAMPLES OF WATER

FROM

LAKE ERIE

AND

NIAGARA RIVER

MAY 1913

Theodore Horton
Chief Engineer.

EXAMINATION OF SANITARY CONDITION OF SHELLFISH GROUNDS

Under the provisions of the State Conservation Law, the State Commissioner of Health may be called upon to investigate and report upon the sanitary conditions of the shellfish grounds within the State. Such investigations were called for in the years 1908, 1912 and 1915. The investigations are necessarily broad in scope and require extensive engineering field work and laboratory technique. They require the services of a comparatively large corps of field and laboratory assistants and considerable office work in the collecting of data, preparation of maps and compilation of the reports.

The investigation called for in 1913 was not completed in that year although the sanitary survey of the shellfish grounds was made and a partial report covering a portion of the shellfish grounds of the State completed and transmitted to the Conservation Commission. The second and third reports covering the remainder of these shellfish grounds and waters were completed in 1914. These three reports, based not only on the 1913 investigation but on the somewhat more extended investigation in 1908 and 1912, make a complete and final report of the Department covering the whole question of pollution and sanitary control of shellfish grounds within the State. These reports follow together with the letter from the State Commissioner of Health to the Conservation Commission transmitting the final report.

SEPTEMBER 16, 1913

EUGENE H. PORTER, M. D., *State Commissioner of Health*, Albany, N. Y.:

DEAR SIR:— In accordance with your directions and at the request of the Conservation Commission acting under the provisions of sections 310 to 312 inclusive of the Conservation Law, I beg to submit the following partial report of our investigation of the pollution of the waters of the State adjacent to and lying near New York city and Long Island where shellfish have been or are being planted and cultivated.

The request of the Conservation Commission for this investigation and examination and for your recommendations as to what oyster beds might be appropriately certified to came so late in the season and the funds and facilities of the Department available for the purpose were so limited, that it was found impracticable to undertake and carry out an investigation with such magnitude and scope as in my opinion (and as was fully pointed out in your report to Hon. B. Frank Wood, Superintendent of Marine Fisheries in

1908), is desirable to furnish the most satisfactory information upon which your recommendations might be based. Very fortunately, however, the whole subject of pollution of shellfish and shellfish waters in the vicinity of Long Island had already been carefully investigated by this Department in former years and although for the same reasons referred to above these investigations were not carried on with the scope and completeness, especially with respect to laboratory tests, which was considered by you desirable or as would have been made possible with ample appropriations, a great deal of valuable information has been obtained relating to the sanitary character of the oyster from the various oyster beds, and harbors adjacent to Long Island with respect to not only bacterial content of the oysters and waters, but especially with reference to the location and amounts of sewage pollution affecting them.

The previous investigations by the Department referred to were carried out in the years 1908 and 1912. The 1908 investigation was general and comprehensive, covered practically all of the waters adjacent to Long Island, and was fully reported on by you to Hon. B. Frank Wood, Superintendent of Marine Fisheries in that year, and published in the 1908 Annual Report of the Department. The investigation of 1912 was more complete with respect to field and laboratory work, but was restricted to only the waters of Jamaica bay. In fact the work in 1912 represented probably one of the most carefully and completely planned and executed shellfish investigations with respect to field work and laboratory analyses of which I have knowledge. Owing however to certain legal considerations in connection with the ownership of these waters which developed before the investigation was completed, no final and complete report was prepared, although a partial report representing the field engineering and laboratory data was prepared and submitted to you.

Owing to the more general but complete character and scope of the 1908 investigation and the limitations referred to in connection with the 1912 investigation of the waters of Jamaica Bay, it is obvious that the 1908 investigation and report are not only of considerably greater importance in connection with the present investigation than the 1912 investigation and report, but owing to the complete detailed sanitary survey that was made in 1908 and the opportunity for confirming the relation which exists between sewage pollution and oyster contamination, this investigation and report of 1908 fortunately afford a working basis for the investigation carried on during the present season of 1913.

Thus, in 1908, as will be seen by reference to the report, a careful and detailed inspection was made of practically every shore and harbor adjacent to Long Island, Manhattan Island, Staten Island, and the mainland in New York State where oysters were grown. From the information thus obtained detailed tables and maps were prepared showing the character and location of all points of pollution entering these waters. In conjunction with such field observations there, samples of oysters and of waters from various selected points were also collected for laboratory analysis for the purpose of confirming the results of the sanitary survey and for the purpose of establishing if possible some definite relation between sewage pollution and oyster contamination. A full discussion of the results of both series of observations was presented in the report together with conclusions and opinions so far as these could be reached from evidence secured.

Briefly stated the reports of this investigation show generally that many harbors, bays and other waters adjacent to the shores which were investigated receive sewage pollution in such considerable amounts that they might be classified as unsafe; others so slightly polluted as to be considered in their present condition safe; and still others the condition of which lies between these limits where there is some question as to the safety of the oysters harvested from them. The bacteriological results were found to be generally consistent with the conditions of pollution of the waters which lie or flow above the beds. That is, where one harbor received more pollution than another the oysters generally showed a higher bacterial count or a greater presence of B. coli. Owing, however, to the many and considerable changes in pollution conditions which occur at any part of a harbor or over any oyster bed as a result of variation of tidal flow, currents, induced by winds, sewage flow, accidental pollution and other factors, it was pointed out that no fixed relation was found to exist or could be rigidly established between intensity of pollution and numerical presence of specific forms of bacteria, nor between either of these and the disease-producing character of such oysters.

Indeed much investigation has been carried on in recent years and much discussion rife concerning the significance of bacteriological tests of shellfish. Not only have conscientious endeavors been made to establish a rational working numerical bacterial standard for rating the sanitary quality or purity or safety of oysters obtained from different layings but such standards have actually been adopted by certain scientific men and bodies who have studied the question. To one who is familiar with principles of bacteriology or with laboratory technique, however, and who knows the limitations of such work and has at the same time studied sewage disposal problems in connection with tidal waters, the futility of accepting these standards alone or even as a primary basis for rating the sanitary quality of oysters or oyster beds, is obvious. I do not mean to underestimate the real value of these bacteriological data nor some of the standards that have been advanced but I do mean to emphasize that the bacteriological tests and standards should not be considered paramount to other more definite knowledge obtainable by more practicable and accurate means; and furthermore that from the nature of the variable factors that affect the contamination of oysters bacteriological results should not be considered as affording in any case more than confirmatory evidence to that ascertained by field observations; in much the same manner that similar bacteriological tests of the water of a well or from the watershed of a supply should be used largely in the light of confirmatory evidence in connection with the sanitary survey of the well or watershed.

Owing to the considerably greater value in general of the sanitary field survey and to the fact that in 1908 a great many bacteriological tests were made in conjunction with the complete sanitary survey, showing approximately and so far as such data could show the general relation between the sewage pollution actually observed in the different bays and harbors, and the presence of the polluting material in the oysters grown in these waters, it was fortunately only found necessary in the present investigation to make a thorough reinspection of the field covered in 1908. In other words if the entire ground covered in 1908 could be resurveyed the new data in comparison or conjunction with the 1908 data would obviously afford a foundation upon which intelligent opinions and recommendations could be now based.

The present investigation was accordingly carried out along the lines thus suggested, the detailed sanitary survey being made by specially trained assistant engineers appointed especially for the purpose, who worked under the immediate guidance of the chief engineer and the principal assistant engineer of the Department. The field notes, maps and other data obtained during 1908 were used in the field and the sanitary conditions which now exist were carefully compared with those in 1908. All pollution which had been removed or discontinued since 1908 was thus observed and recorded, as were also any additional sources of pollution that were found.

Although at this writing there remain some sections of tidal waters which have not been carefully covered as outlined above, the greater part of them have been resurveyed and a careful study is now being made to determine what portions of the bays, harbors or other tidal waters in which oysters are cultivated are so situated with respect to sewage pollution or other contaminating influence that the oyster beds located therein may reasonably be considered and recommended as being in good sanitary condition. It is this information that is required and has been requested by the Conservation Commission and it is their desire that as soon as possible we furnish them with such information and advice as will enable them to start without delay the work of issuing certificates to oystermen.

One of the principal bays where important oyster beds of considerable area are situated is Great South Bay. This large body of tidal waters extends along the south shore of Long Island from Amityville to Smith Point, a distance of approximately 30 miles, and the oyster industry therein is one of the most extensive and important along the shores of Long Island. No public sewers discharge directly into the bay and with few exceptions the waters of the bay do not receive any considerable pollution.

Of an estimated total population of 2,200 persons which contribute pollution to the waters of the bay, some 2,000 are restricted to the waters in the vicinity of Amityville, Patchogue, and Bayshore, the remaining 200 being scattered principally along the shores of inlets between these points. The most serious pollution is at Patchogue and the immediate vicinity, where the sewage of some 1,500 persons is discharged directly into Patchogue creek. The pollution is some 5 or 6 times as great as at Amityville or Bayshore.

After a careful study of the conditions of pollution of the waters of Great South bay with respect to the location and amount of sewage discharged along the shores or into the arms or inlets connecting with it and to the hydrographic and meteorological conditions under which this sewage may be carried out to and contaminate the oyster beds situated in Great South bay I am of the opinion that with the exception of certain areas in the vicinity of the outlets of the tidal streams or arms into which the sewage of the above-named places is discharged and which cannot be considered safe nor in good sanitary condition the remainder of Great South bay is so free from pollution that the oyster beds situated therein may, within the meaning and intent of the provisions of the Conservation Law above referred to, be considered in a sanitary condition.

I would therefore recommend that the Conservation Commission issue certificates to the owners, lessees, or persons in possession of grounds from which oysters or other shellfish are taken or upon which the same have been planted or cultivated in Great South bay with the exception of the following areas:

1. Within one mile of the mouth of Amityville creek
2. Within one mile of the mouth of Penataquit creek
3. With two miles of the mouth of Patchogue creek.

Very respectfully,

THEODORE HORTON,

Chief Engineer

December 30, 1913

EUGENE H. PORTER, M.D., *State Commissioner of Health, Albany, N. Y.*

DEAR SIR:— On September 16 I submitted to you a report covering our investigation of the pollution of shellfish waters in the vicinity of New York city and Long Island, made during the summer and early fall of this year at the request of the State Conservation Commission acting under Sections 310–312 inclusive of the Conservation Law.

This report, while referring primarily to our investigation of 1913, also reviewed briefly the work and findings of former investigations of this Department, more particularly the investigations made in 1908 and 1912. It discussed also briefly certain general principles underlying a correct interpretation of physical and analytical data concerning oyster pollution and referred to certain classifications of this nature with respect to character and intensity of pollution and to the safety of these waters for oyster propagation and cultivation. This report finally sets forth that it was possible at that time, in view of the information then available, to recommend to the Conservation Commission the issuance of certificates to owners, lessees or persons in possession of grounds from which oysters or other shellfish are taken or upon which they have been planted or cultivated, in certain waters, more particularly portions of Great South bay.

Since the submission of my report of September 16, 1912, further studies have been made of the waters adjacent to Long Island and as a result of the studies I find that there are other bays, harbors, or tidal waters in addition to portions of Great South bay which are so free from serious pollution that the oysters situated therein may, within the meaning and intent of the provisions of the Conservation Law referred to, be considered to be in a sanitary condition.

I beg to recommend, therefore, that the Conservation Commission issue certificates to the owners, lessees, or persons in possession of grounds from which oysters or other shellfish are taken or upon which the same have been planted or cultivated in the following waters adjacent to Long Island in addition to the portions of Great South bay referred to in my report to you of September 16, 1913:

1. Moriches bay, excluding the area north of a line running from Speonk point westerly through a point one mile south of Masury point to the main land
2. Quantuck bay
3. Shinnecock bay.
4. Mecox bay
5. Great Peconic bay east of a line connecting Red Cedar point and Mianogue point
6. Little Peconic bay west of a line connecting Jesup Neck and Cedar Beach point
7. Gardner's bay and Shelter Island sound east of the line connecting Cedar point and Long Beach point.
8. Block Island sound and tributary bays east of Gardner's bay to Montauk point
9. Long Island Sound and bays tributary thereto on the north side of Long Island and east of Mt. Misery Point, with the exception of Mt. Sinai harbor.

Respectfully submitted,
THEODORE HORTON,
Chief Engineer

April 20, 1914

HERMANN M. BIGGS, M.D., *State Commissioner of Health, Albany, N. Y.*

DEAR SIR:— I beg to submit the following final report on the results of our investigation of the pollution of tidal waters used for the cultivation of oysters, in the vicinity of New York city and Long island, carried out in 1913 at the request of the Conservation Commission and in accordance with the provisions of the Conservation Law, Sections 310–312, inclusive:

The first progress report submitted in this matter, dated September 16, 1913, outlined generally the scope and work of the investigation of 1913, and reviewed briefly the work and results of the previous investigation of the Department undertaken in 1908 and 1912. In this report a brief discussion was presented of the oyster pollution question as a whole, attention being called to the limitations of what might be termed laboratory investigation methods and to the necessity of viewing the problem from a broad engineering standpoint as well if it is expected that a practical and rational working policy be established with respect to the supervision of the oyster industry and the conservation of the purity of the tidal waters where oyster beds are located.

It was further pointed out in the first report that the waters in the vicinity of New York and adjacent to Long Island vary greatly in the extent to which they receive pollution; ranging from those tidal bays and harbors which receive so little pollution that the question of safety of oysters was beyond doubt to those waters so grossly contaminated and the danger so obvious that the exclusion of them for oyster cultivation was also beyond doubt. Between these two classes, it was further pointed out, there was an intermediate class of tidal waters where local conditions with reference to sources and amount of pollution, the location of beds, and hydrographic and meteorological conditions were such as to render the question of prohibition for oyster cultivation on the one hand and the protection of the waters against pollution on the other hand more indefinite and deserving of most careful consideration before final recommendations could be made.

For reasons set forth, the first and second progress reports dealt largely with those bays, harbors, and other bodies of tidal waters where sewage pollution was less intense and where with greater simplicity and positiveness recommendations could be made concerning the safety of the oyster beds and consequently where the issuance of certificates by the Conservation Commission under the provisions of the Conservation Law might with certain reservations be recommended.

The tidal waters thus considered included, as might naturally be expected, the bays and harbors lying generally toward the easterly end of Long Island, more specifically the waters east of Mt. Misery point on the north side of the Island, and east of and including Great South bay on the south side of the Island. The first report dealt exclusively with Great South bay and the second report with the remaining waters thus referred to.

This final report brings us then to a consideration of the tidal waters lying toward the westerly end of Long Island and Staten Island, where the bays and harbors are, generally speaking, more subject to pollution and where a more careful consideration and discrimination must be made with reference to the existing and possible future pollution of the oyster beds and to the propriety of exclusion of certain bays and harbors where it would not be safe to continue oyster cultivation. A careful study has been made of each of the bays and harbors and of Long Island Sound west of Mt. Misery point and Great South bay and it has been found that these waters may be considered as falling under two classes rather sharply defined; one where the intensity of pollution and local conditions affecting the contamination of the oyster beds are so serious as to render the waters, without further consideration, unfit for oyster cultivation, and where their reclamation is impracticable; the other, where the intensity of pollution and local conditions are such that they are either now safe or can be made so by the application of practical means of sewage disposal or of sewage elimination. In other words, the first class is from the standpoint of practical supervision of both oyster industry and sewage pollution unreclaimable; while the second class is from the same standpoint reclaimable. The merits as to which of these waters of the latter class should be reclaimed for oyster cultivation will depend upon a number of considerations of an essentially practical nature which will be considered later in the report.

Considering the first of the classes of waters above referred to where the sewage contamination is, in general, the greatest, I find from a careful study of intensities of sewage pollution, of the laboratory results of our previous investigations, and of the local conditions under which contamination of oyster beds in each case is made possible that the following waters, viz.— Little Neck bay, Flushing bay, Pelham bay, Eastchester bay, Raritan bay, Jamaica bay, and all other waters west of Heulet's point on the north and Far Rockaway on the south shores of Long Island, are so grossly polluted and the elimination or purification of sewage from sewers, shipping, and other sources so impracticable as to render them unsafe for oyster cultivation and impossible of reclamation.

Much has been said regarding the retaining or reclaiming of these waters for oyster growing by the construction of intercepting sewers and sewage disposal plants; also of the possibility of using these grossly polluted waters for oyster propagation and of later transferring the seed or partially grown oysters to other grounds not so polluted for maturing and purging. The first of these is impractical from the standpoint of efficiency of operation and of prohibitory expense to obtain safe effluents. The second is impractical on the grounds of difficulty of administration or supervision over the oyster industry, and the secondary danger of transference of polluted oysters and muds to clean waters, where these waters will in consequence become in turn contaminated. Furthermore, even if the sewage purification to a safe degree were practicable there would be the residual danger of contamination from the shipping industry or from other incidental and accidental sources just as serious in character even though lesser in amount.

One of the most important factors of a practical nature in connection with the pollution of oyster beds, which does not seem to be sufficiently appreciated, is the constant menace to which oyster beds are subject when located in a confined harbor or bay where any considerable amount of sewage is discharged into *any* point of the bay, due to the transportation of sewage and *other pollution* by means of currents induced by tidal and wind action.

While this principle is applicable to the first class of tidal water referred to, it is especially applicable to the second class of bays and harbors less polluted in general and mostly of smaller area. A study of a large number of laboratory tests of waters and oysters made in 1908 shows clearly that, when sewage in considerable amounts is discharged into a bay or harbor of limited area, we generally find the oysters taken from *any portion* of the bay or harbor contaminated, notwithstanding that the water over these beds may at times not show the pollution. The recent hydrometeorological observations carried on at Erie, Pa., and at Rochester and Auburn, N. Y., on the Travel of Pollution by Currents Induced by Wind Action prove conclusively what has been long accepted, that winds will induce translatory currents which will carry pollution quickly and positively from one point to another according to their intensities and directions.

This is a very significant factor, for it means that a bay or harbor of limited area must be taken as a whole when dealing with the question of safety of any oyster beds located at one point of the bay with the discharge of sewage at some other point. If the tidal flow is considerable, the ebbing and flooding alone may carry pollution ultimately by a series of successive oscillations to distant points around the shores of the bay even though any infectious material thus transported may in some cases be quite diluted and attenuated. Again, should the tidal flow be small, this fact would not necessarily lessen the rapidity of transference of a pollution by wind actions. Nearly all of the bays along Long Island, especially those on the north shore west of Mt. Misery point, are sufficiently small in area to permit the sewage discharged at any point in the bay to be easily and rapidly transported across the bay to oyster beds located at the most distant point.

It is thus easily explained why with all of these smaller bays where any considerable amount of sewage is discharged into them that not only do the laboratory tests show the presence of *B.* coli but that in nearly all cases the oysters show more pollution than the water above them. In other words no point of a bay of moderate area into which sewage is discharged is free from intermittent contamination, carried to it by the chance components of tidal and wind-induced currents; and as a corollary any oysters located at any point in the bay will receive the accumulated sewage deposits from the sewage thus intermittently carried to them.

In other words, it should be emphatically pointed out that any one of these small bays and harbors must be considered as a unit, i. e., be either rejected as a whole, or reclaimed as a whole. If the harbor has a considerable population around its shores, with its incidental pollution arising from sewage discharge, shipping, bathing, boating, and other sources, it becomes financially and practically impossible to protect adequately the oyster beds located in it from dangerous contamination. If, on the other hand, the population around the shores is small and the source of pollution from shipping, bathing, boating, etc., insignificant, it is both financially and practically possible to adequately and properly protect the oyster beds in the bay from any serious contamination.

Applying with more definiteness, then, what has been thus said with reference to the manner and extent to which sewage discharged into a confined bay or harbor will contaminate oyster beds located at any point in the bay to the second class of waters referred to above, where discrimination must be carefully made with respect to local conditions, and keeping in mind that this class includes those bays, harbors, and other tidal waters lying west of and between Mt. Misery point and Manhasset bay on the north side of the Island and west of and between Great South bay and Jamaica bay on the south side, it is important to note that the waters which are the more seriously polluted at the present time have comparatively few and small areas of oyster beds in them, while those waters which are less polluted have the largest areas of oyster beds. What effect, if any, this more serious pollution of certain bays has had in lessening the extent of oyster cultivation in them is not clear. The example afforded by Jamaica bay, with its intense pollution and large oyster beds, is certainly no argument that the increasing pollution of these bays and harbors has driven the oyster industry out of them or that the removal of sewage pollution from them would induce a return or redevelopment of oystering in these waters.

The fact, therefore, that these more polluted bays of the second class where reclamation, though possible, would be difficult and where processes of sewage disposal having a high degree of purification would be expensive have few oyster layings in them is indeed fortunate, for it means that less hardship, if such it might be considered, would be caused in abandoning these waters for oyster culture. The practical question is, therefore, one also of relative importance of interests involved. Thus it is obvious that, if only a few beds are to be conserved at a large expense to municipalites for purification process of an otherwise unnecessarily high degree of purification, the bay oyster beds should in justice be abandoned. If, on the contrary, there are large areas of valuable oyster beds and only a small population to be provided with costly disposal plants of high degree of purification, it is evident that these beds should be thus conserved and every effort made to remove or purify all sewage pollution discharged into the bay.

More specifically, then, it has been found from a careful study of these bays and harbors of this class lying between Mt. Misery point, and Manhasset bay on the north and between Great South bay and Jamaica bay on the south, that they fall practically into three subdivisions as follows:

1. Waters like Smithtown bay and the outer waters forming a part of Long Island Sound, which, with few or no restrictions, may be safely used at the present time for oyster cultivation.
2. Waters like Huntington bay, Oyster bay, and South Huntington harbor, having large areas of valuable oyster beds the pollution of which renders them at this time unfit for oyster cultivation, but which are reclaimable by proper methods of sewage purification or elimination.
3. Waters like Hempstead harbors and Manhasset bay, having comparatively few and small areas of oyster beds, the pollution of which renders them at this time unfit for oyster cultivation but which pollution can be readily purified or eliminated, but where the cost of reclamation to the high standard necessary for oyster cultivation is, in view of the expense entailed and the comparatively small value of the oyster beds, not justified.

It is hardly to be expected that the adoption of any policy with reference to this oyster pollution question will meet the full approval of all of the opposing interests involved. There are, for instance, on the one hand, the oystermen, who wish to have all of the waters around Long Island suitable for oyster growing maintained in such a degree of purity that they will be permitted to continue the cultivation of oysters in them; something that, as I have pointed out, is impractical from both the sanitary and economic standpoint. On the other hand, we have the municipalities with the municipal and private sewage to be cared for and which are reluctant and in many cases unable to pay for the excessive cost of purification plants of the high degree of efficiency necessary to safely protect the oyster beds.

It would seem, therefore, that the policy suggested above and in my previous reports to you in the matter, viz.— of excluding entirely certain bays and harbors which are so grossly polluted as to be beyond range of practical reclamation; of including and conserving entirely those waters which are practically unpolluted; and of discriminating carefully as outlined above among the intermediate class of waters according to relative importance of the opposing interests involved with due regard to sanitary requirements; is one that is rational, consistent, and practical from the standpoint of public health, equity regarding burden of expenses, and simplicity of administration and supervision.

I would therefore recommend with reference to the tidal waters lying west of Mt. Misery point on the north side of Long Island and of Great South bay on the south:

1. That certificates be issued by the Conservation Commission at this time to owners, lessees or persons in possession of grounds from which oysters or other shellfish are taken or upon which the same have been planted or cultivated, only in the following waters and under the restrictions stated:
   (a) Long Island sound, Mt. Misery point to Crane Neck point.
   (b) Smithtown bay and tributary harbors, excluding Missaquogue river and the waters of Smithtown bay within two miles of the mouth of Missaquogue river.

(c) Long Island sound from Eaton point to and including Matinicock point.

2. That certificates be issued by the Conservation Commission in the future to owners, lessees, or persons in possession of grounds from which oysters or other shellfish are taken or upon which the same have been planted or cultivated, in the following waters when the sewage discharged into those waters has been removed or satisfactorily purified:

(a) Port Jefferson harbor, into which the sewage of some 600 persons directly or indirectly discharges.

(b) Missaquogue river and Smithtown bay, within two miles of mouth of river into which the undisinfected effluent of Kings Park State Hospital discharges.

(c) Huntington and Northport bays and harbors, into which the raw sewage of some 2,000 persons discharges.

(d) Oyster bay and Cold Spring harbor, into which the raw sewage of some 600 persons discharges.

(e) Hempstead bay (including Broad channel, Middle bay,, East bay, South Oyster bay, and adjacent waters), into which the raw sewage of some 800 persons will discharge when the sewage disposal plant at Freeport (population 6,500) is completed.

3. That no certificates whatever be issued in the following waters:

(a) Hempstead harbor
(b) Manhasset bay
(c) Little Neck bay
(d) Flushing bay
(e) Pelham bay
(f) Eastchester bay
(g) Raritan bay
(h) Jamaica bay
(i) All other tidal waters west of Hewlett's point on the north and Far Rockaway on the south side of Long Island.

4. That generally and with respect to all waters where the issuance of certificates has been recommended, a narrow strip of water area one-quarter to one-half mile wide adjacent to all shores be excluded for the propagation, cultivation, or maturing of oysters.

In connection with the recommendation contained above under heading (2), it may be pointed out that the comparatively few restrictions made as to the tidal waters included in my previous report might in nearly all cases be removed when the sewage discharged into these waters has been removed or satisfactorily purified.

No reference has as yet been made to the question of transferring oysters to other waters and places for the purpose of floating, fattening or storage. This is a very important matter and will require the strictest supervision. It is well known that many floats and places of temporary storage have in the past been selected in waters which are more or less dangerously polluted and I am of the opinion and strongly recommend that the Conservation Commission do not license or permit the floating or storing of oysters in any of the waters that have been excluded for oyster cultivation according to the above recommendations, unless they are at the mouths of streams where the local conditions would preclude any contamination.

In order that the findings and recommendations as set forth in this and the preceding two reports with reference to the extent of the pollution of the various tidal waters in the vicinity of New York and Long Island and the areas which, within certain reservation, should or should not be used for oyster cultivation, may be more readily and clearly illustrated by the accompanying map. The shaded areas and the reference key will be self-explanatory, although in preparing the key the terms and expressions have been used merely as explanatory and should be considered only in connection with the text of the report and with the reservations and fuller explanations expressed therein.

Respectfully submitted,
THEODORE HORTON,
Chief Engineer

May 11, 1914

HON. GEORGE E. VAN KENNEN, *Chairman, State Conservation Commission, Albany, N. Y.*

DEAR SIR:— Your letter of June 27, 1913, requesting this Department to assign Sanitary Inspectors in order to determine the sanitary condition in the shellfish grounds, has been given careful consideration by this Department.

I note in your letter of June 27 that you as Chairman of the Conservation Commission have authority to request us to do this work under Section 311 of the Conservation Law. In your letter you state as follows: "The Conservation Commission has passed a resolution, authorizing the Chairman of said Commission to request you to designate and assign Sanitary Inspectors for the purpose of determining the sanitary condition of the shellfish grounds and the products thereof,— I respectfully request that you designate inspectors for such purposes."

Acting in accordance with your request, this Department has made a complete study of the oyster grounds, and has already submitted to you two partial reports showing the tidal waters east of Mt. Misery point on the north and Great South bay on the south of Long Island, which are at this time in a sanitary and safe condition, and those waters which are not. The third and final report is now complete and covers our study of the remaining tidal waters lying west of Mt. Misery point on the north and Great South bay on the south, and I beg to transmit it herewith.

I understand from the conference had between Commissioner Van Kennen and Dr. Williams on April 24, 1914, that you desired to be informed specifically as to what waters around Long Island are in a sanitary and safe condition for the cultivation of oysters. If you will refer to pages 9 and 10 of the first report of our Chief Engineer, dated September 16, 1913; page 3 of the second report, dated December 30, 1913, and page 11 of the third and final report herewith transmitted, dated April 20, 1914, it will be seen that the following waters around Long Island are at this time in a sanitary and safe condition:

1. Great South bay, with the exception of the following areas:
   (a) Within one mile of the mouth of Penataquit creek
   (b) Within one mile of the mouth of Amityville creek
   (c) Within two miles of the mouth of Patchogue creek
2. Moriches bay, excluding the area north of a line running from Speonk point westerly through a point one mile south of Masury point to the main land
3. Quantuck bay
4. Shinnecock bay
5. Mecox bay
6. Great Peconic bay east of a line connecting Red Cedar point and Miamogue point
7. Little Peconic bay west of a line connecting Jessup Neck and Cellar Beach point
8. Gardiner's bay and Shelter Island sound east of the line connecting Cedar point and Long Beach point
9. Block Island sound and tributary bays east of Gardiner's bay to Montauk point
10. Long Island Sound, Mt. Misery point to Crane Neck point
11. Smithtown bay and tributory harbors excluding Nissequoque river and the waters of Smithtown bay within two miles of the mouth of Nissequogue river
12. Long Island sound from Eaton point to and including Matinicock point

Very truly yours,
HERMANN M. BIGGS,
State Commissioner of Health
By DELANCEY K. JAY,
Secretary

INVESTIGATION OF SANITARY CONDITION OF STATE INSTITUTIONS

Section 14 of the Public Health Law which, prior to the year 1913, provided for investigation of the sanitary conditions of certain State institutions which report to the Fiscal Supervisor of State Charities, was amended to include all of the State institutions. There are over eighty of these institutions owned and managed by the State, only eighteen of which, however, report to the Fiscal Supervisor. The increased work entailed by extending these investigations to all of the State institutions has necessitated the appointment of a special Assistant Engineer who devotes his entire time to this work.

These investigations comprise in all cases a careful inspection of the grounds, buildings and other features to determine the sanitary conditions with respect to water supply, sewerage, sewage disposal, plumbing, ventilation, garbage disposal, milk supply, etc. Although this work has covered only a portion of the year 1914, the following institutions were investigated and reported upon and as required by law, the reports transmitted to the institution authorities:

Batavia; New York State School for the Blind.

Bath; New York State Soldiers' and Sailors' Home.

Elmira; New York State Reformatory.

Hudson; New York State Training School for Girls.

Industry; New York State Agricultural and Industrial School.

Napanoch; Eastern New York Reformatory.

Oxford; New York State Women's Relief Corps Home.

Syracuse; Syracuse State Institution for Feeble-Minded Children.

Watkins; Watkins Glen Reservation.

West Haverstraw; Hospital for the Care of Crippled and Deformed Children.

Willard; Willard State Hospital.

Below will be found abstracts of the reports on the above institutions.

New York State School for the Blind (Batavia)

The New York State School for the Blind is located in Genesee county, in the northern part of the village of Batavia. The buildings are situated on a knoll at an elevation of about 920 feet above sea level and higher than all other land in the vicinity. There are in all, 10 buildings belonging to the institution, the more important of them being the main building, kindergarten building, power house and laundry, gymnasium, hospital, green house and barn.

Those eligible for admission to the institution are blind persons between the ages of 5 and 21 years who are not incapacitated by mental, physical or moral infirmities for useful instruction. The pupils are retained in the institution until, in the opinion of the Board of Managers, they have received the amount of training practicable in each particular case. The enrollment at the institution at the time of the inspection was 99 boys and 68 girls, a total of 167, in addition to which there were about 60 employes, making a total population of 227.

This institution was inspected on July 29, 1914. A report covering in detail the results of the investigation as to the sanitary conditions at the time of inspection included the following conclusions and recommendations:

Conclusions and Recommendations

"(1) That, in view of the unsatisfactory character and quality of the three water supplies being used at the institution, all these supplies be eliminated and a new supply sufficient for the needs of the institution in all respects and of a safe quality be provided in their stead. This may be accomplished by either installing an entirely new supply or by providing proper and efficient purification of one or more of the present supplies.

(2) That, regarding fire protection:

(a) The present water pressure is insufficient for fire protection, and, therefore, steps should be taken at once to either furnish a water supply with sufficient pressure, or a special fire pump which can be called upon to increase the pressure in case of fire to an amount which will furnish efficient fire protection.

(b) More fire hose be provided and also a hose cart so that the hose can be more easily and quickly handled.

(3) That, as recommended in the previous report, 'Better and more convenient storage accommodations should be provided for storing other supplies for food than those kept in the cold storage.'

(4) That regarding hospital facilities:

(a) Since the old hospital is insanitary and not safe for use, a new hospital of a modern type, large enough to care for all the sick at the institution and to thus eliminate the necessity of maintaining sick rooms in the main building, be provided as soon as possible.

(b) The regular services of a trained nurse be secured.

(c) An isolation ward or building be provided for the safe quarantine of all contagious diseases."

New York State Soldiers' and Sailors' Home (Bath)

The New York State Soldiers' and Sailors' Home is located at Bath, in the county of Steuben. The institution is about two miles southwest of the village near the Cohocton river, on sloping ground which offers good drainage. The buildings consist of six barracks, hospital, mess hall, assembly hall, chapel, boiler house, quartermaster's store, ice house, bakery, various cottages for the officers, barns and other similar structures. The institution owns 375.5 acres of land, the majority of which is used for agricultural purposes. That portion in the immediate vicinity of the building, however, is pleasantly laid out in lawns and flower gardens, offering excellent recreation grounds for the inmates.

The object of the institution is to furnish a home and care for the dependent soldiers and sailors who are residents of New York State and veterans of the Civil or late Spanish-American wars. The population of the institution at the time of the inspection was 1,210 inmates, in addition to which there are 168 employes, making a total population of 1,378. The average age of the inmates was about 71 years.

The institution was visited and inspected on July 14–15, 1914. As a result of this investigation certain insanitary conditions were found to exist at the institution and, therefore, the following conclusions and recommendations were made in a detailed report:

Conclusions and Recommendations

"(1) That the conditions of the basements for quartering inmates is entirely unsatisfactory and, therefore,

(a) That their use as dormitories or sleeping quarters be discontinued in all cases and that quarters be provided elsewhere.

(b) That if they are to be used as retreats or lounging rooms for the inmates they be repaired, provided with sufficient light and ventilation and otherwise put in suitable condition.

(2) That in view of the unsatisfactory condition and inadequacy of the building being used as a slaughter house, its use for this purpose be discontinued and another building provided with a concrete or other nonporous floor and otherwise properly equipped, be provided in its stead.

(3) Regarding water supply:

(a) That in view of the evident pollution at times of the well water, and the close proximity of sewers to the wells, steps be taken to determine the exact cause of the pollution and that the source of pollution be eliminated or that a new and safe supply be developed and the present contaminated supply abandoned.

(b) That the spring used as a supply at the farm be cleaned and put in a good sanitary condition and, further, that the area of the pasture draining directly into the spring and the spring itself be enclosed with a fence and that cattle or other live stock be kept out of the enclosure.

(4) That in view of the apparent inadequacy of plumbing fixtures:

(a) Better toilet facilities be arranged in the barracks by providing more fixtures.

(b) More adequate bathing facilities be provided either by furnishing more baths at the bath house or by installing them in the barracks.

(5) Regarding sewage disposal:

(a) That as recommended in the previous report the sludge bed be removed to a point further from the institution buildings.

(b) That in view of the occasional clogging of some of the sewers, they be flushed at regular intervals sufficiently frequent to eliminate this trouble.

(6) That in view of the objectionable location and insanitary condition of the dump, its location be changed to some place removed from the river so that the drainage is not directly into the stream, that it be kept in a more sanitary condition and, further, that the present dump be cleaned up and put in a more sanitary condition.

(7) That in view of the evident unsatisfactory condition of the milk supply:

(a) Regular and more frequent inspections be made of the dairies and herds furnishing the milk for the institution.

(b) Some effective method be provided at the farm for sterilizing milk pails and utensils.

(c) The milk be pasteurized in a modern pasteurizer, this especially in view of the evident somewhat tubercular condition of the herd and also of the fact that part of the milk is obtained from an outside source and is thus not directly controlled by the institution.

(8) That in view of certain unsatisfactory conditions regarding the cold storage system:

(a) More adequate facilities in this line be provided at the hospital.

(b) More efficient ventilation be provided for the cold storage at the quartermaster's building.

(9) That in view of the possible infection of the foods from flies, window and door screens be adequately provided for all dining rooms and kitchens. also for the store house.

(10) That an elevator is much needed and should be provided in the hospital."

New York State Reformatory (Elmira)

The New York State Reformatory is located at the city of Elmira, in the county of Chemung. The institution owns some 138 acres of land just to the northwest of the city. The buildings, comprising the cell halls, shops, etc., which are located inside a stockade, and the barns just to the rear of it, are situated on an elevated table land overlooking the Chemung river valley.

The inmates of the reformatory are composed of males, between the ages of 16 and 20 years, who have been convicted of a felony, but who have not been convicted of a crime punishable by imprisonment in a State prison prior to this conviction. The average number of inmates is approximately 1,350.

The institution was visited and inspected on May 25 and 26, 1914. This inspection brought out the fact that certain insanitary conditions existed at the institution and after a careful study of the situation the following conclusions and recommendations were made in a complete report on the investigation:

Conclusions and Recommendations

" (1) Water supply:

(a) As recommended in the 1911 report:

'That in view of the present appreciable pollution and possible infection of the institution supply of water and the more uniform safety of the city supply, the institution supply be abandoned entirely and reliance placed upon the city supply; or, as an alternative and possibly more economical plan, the institution supply be fully developed and purified by a properly installed and operated filter plant and this supply used to the exclusion of the city supply.'

(b) That in view of the possibility of contamination of the spring now being used for drinking water, the use of this spring be discontinued.

(c) That the drinking water pails and tin drinking cups also the common drinking cups in the visitors' waiting room and the offices be eliminated and drinking fountains or sanitary drinking cups and running water be provided in their stead.

(2) That arrangements for providing new and more sanitary dishes be made at an early date, and, furthermore, that dish washers with an abundant supply of hot water be provided for dish washing instead of the present method of washing them by hand.

(3) That as recommended in the 1911 report, 'suitable fire escapes be furnished and placed upon the domestic building.'

(4) That, as also recommended in the 1911 report, 'an aerator for cooling milk at the dairy should be furnished.'

(5) That a new foundry be constructed or the old one remodeled so as to provide better light and ventilation."

New York State Training School for Girls (Hudson)

The New York State Training School for Girls is located in the southern portion of the city of Hudson, in Columbia county, near an arm of the Hudson river known as South bay. The institution owns 117 acres of land. The buildings, consisting of an administration building, chapel, industrial building, teachers' quarters, storehouse, disciplinary, power house, 14 cottages, barn and other accessory buildings, 29 in all, are located on a plateau at an elevation of about 100 feet above the level of the river.

The institution is maintained for the training of dependent and delinquent girls between the ages of 12 and 16 years, who are legally committed thereto by any court having authority to make such commitment. They may remain until 18 years of age and are under guardianship until 21.

The population of the institution at the time of the inspection was 330 inmates and approximately 70 employes, making a total of 400.

An inspection was made of this institution on June 3 and 4, 1914. The report made on this investigation contained the following conclusions and recommendations:

Conclusions and Recommendations

"(1) That in view of the insanitary, unsafe and crowded condition of some of the buildings:

(a) A new building of a modern type be provided for industrial purposes or that the old one now being used be repaired and remodeled so as to make it safe and sanitary in all respects.

(b) A modern structure providing sufficient and satisfactory quarters for the teachers and staff be provided and the old hospital building now being used for that purpose be either abandoned or used for some purpose for which it is better adapted.

(c) A disciplinary building providing proper ventilation and other sanitary conditions be provided and the building now being used for the purpose either abandoned or used for some other more appropriate purpose.

(d) That proper improvements be made to the farm buildings in order that they may easily be keep in a good sanitary condition.

(2) In view of the populous character of the watershed and the opportunities for direct and indirect contamination of the public water supply of the city of Hudson; of the defects and omissions in the construction features of the filter (as repeatedly pointed out by this Department); of the inefficient operation of the filter as shown by analyses made from time to time by this Department;; and of the resulting unsafe condition of the water supply, that the institution authorities furnish a supplementary purification plant for the treatment of their supply or that they obtain an independent new supply of pure and safe quality.

(3) That steps be taken at once to provide lights in the girls' rooms where not already so provided.

(4) That proper alarm systems be provided in the way of an electric annunciator to eliminate the necessity of locking the girls in their rooms at night, and also an institutional fire alarm system, by which an alarm may be turned in from any of the buildings."

New York State Agricultural and Industrial School (Industry)

The New York State Agricultural and Industrial School is located in the northeast corner of the town of Rush, Monroe county, about 14 miles southwest of the city of Rochester. The institution owns about 1,432 acres of land, the surface of which is somewhat irregular, varying in elevation from approximately 530 to 620 feet above sea level. There are in all some 50 buildings, including the administration building, 32 cottages for inmates, employees' cottages, farm buildings and other less important structures.

The buildings are arranged in groups, there being, however, a distance of about 1½ miles between the most northerly and most southerly group. In general the buildings are pleasantly located and, with the exception of two or three old frame houses, they are well constructed.

The purpose of the institution is the training of delinquent boys who are committed to the school by any court having authority to make such commitment. They are received from the age of 7 to 16 years and are detained at the institution from about 1 to 2 years. The average number of inmates during the last year was 715, in addition to which there are 180 employes, making a total population at the institution of 895.

A report covering in detail the results of an investigation of the sanitary conditions at this institution, made on July 27 and 28, 1914, offered the following conclusions and recommendations regarding sanitary improvements:

Conclusions and Recommendations

"(1) That, in view of the dampness in the basements of buildings, the necessary improvements be made to prevent water entering any of the basements of the buildings at the institution.

(2) That the construction of those sewage disposal plants, approved by the Department and not yet constructed, be completed as soon as possible and put into operation.

(3) That more adequate heating facilities be provided in the service cottage.

(4) That, in view of the difficulty in operating some of the ventilators in the industrial buildings, the necessary changes be made to insure the separate and easy operation of the skylights in these buildings and that proper ventilation be maintained.

(5) That, in view of the lack of fire protection at the institution,

(a) Suitable apparatus, including hose and hose carts, be provided and conveniently placed about the institution to insure good protection in case of fire.

(b) An efficient company be organized and drilled for operating the apparatus in case of fire.

(6) That, regarding the milk supply:

(a) Efficient means for sterilizing the milk pails and cans (preferably steam sterilizers) be adopted in all cases.

(b) Aerators be provided for cooling the milk at the dairies in all cases.

(c) The milk houses be properly screened and greater precautions taken to eliminate flies from them.

(7) That, in view of the possibilities of infection from contaminated water in the swimming pool, preliminary baths be required immediately before entering the swimming pool and that the water in the tank be changed more frequently.

(8) That, in view of the evident crowded condition at the hospital during certain seasons of the year, the contemplated addition to the hospital be completed as soon as possible in order that the boys may be properly cared for at all times."

Eastern New York Reformatory (Napanoch)

The Eastern New York Reformatory is located at Napanoch, Ulster county. It is situated on the Kingston branch of the Ontario and Western railroad, about half way between the city of Kingston and Middletown. The wall enclosing buildings consisting of the cell hall, mess hall, bath house, laundry, school building and power house, extends to within about 500 feet from the railroad station, but the village of Napanoch is nearly one mile to the west. The land belonging to the institution consisting of a 293 acre tract which extends from Rondout creek at an elevation of 280 feet above sea level to the east and up to the side of the Shawangunk mountains to an elevation of about 1,100 feet.

The object of the institution is to care for the surplus population from the New York State Reformatory at Elmira, in connection with which it is carried on. The class of inmates are thus the same in both institutions, namely, males between the ages of 16 and 20 years convicted of felony, who have not been previously convicted of a crime punishable by imprisonment in the State prison. The number of inmates present at the time of the inspection was 464, the number of employes 53, making a total population of 517.

A detailed report, based upon an inspection made of the institution on August 7, 1914, pointed out that several insanitary conditions existed, in consequence of which the following conclusions and recommendations were offered:

Conclusions and Recommendations

"(1) That, in view of the unsatisfactory condition of the floors in the stable, they be repaired and put in a more sanitary condition.

(2) That, since there is opportunity for chance pollution of the water supply incidental to the presence of trespassers in the vicinity of the reservoir, a fence be constructed enclosing this territory and trespassing forbidden.

(3) That the work of providing plumbing fixtures in the cells be completed as soon as possible.

(4) That the insanitary privies being used about the institution grounds be abolished, and adequate toilet facilities in nearby buildings or sanitary privies be provided instead.

(5) That, to insure more adequate protection in case of fire, a fire company be organized and drilled in the manipulation of the fire apparatus.

(6) That the dairy supplying milk to the institution be more regularly and frequently inspected by the institutional authorities, and, further, that better sanitary facilities for handling the milk in the way of an aerator for cooling it at the dairy, facilities for sterilizing the utensils, etc., be insisted upon.

(7) That, in view of the possibility of the ice obtained from Honk lake being contaminated, its use in direct contact with drinking water be discontinued.

(8) That, in view of the apparent need of more adequate quarters and especially the need of culinary accommodations for the employes, means of providing them be carefully considered by the authorities of the institution.

(9) That window and door screens be provided for all dining rooms and kitchen.

(10) That, regarding hospital facilities:

(a) In view of the inadequate quarters and facilities of the hospitals, the necessary steps be taken at once by the institutional authorities to provide either a new hospital or more satisfactory quarters, with sufficient and adequate equipment, and in connection with this, that satisfactory provision be made for a laboratory and dispensary, also that proper quarters be provided for the tubercular patients and for quarantine facilities.

(b) As recommended in the report on the previous investigation, 'a graduate nurse be employed to assist the physician in his duties and to see that the hospital quarters are kept in better condition of cleanliness.'

(c) The necessary arrangements be made to secure the services of a dentist and an oculist to properly care for the inmates when their services are needed.

(11) That, in view of the absence of facilities to properly care for the bodies in case of death, adequate facilities be provided."

New York State Women's Relief Corps Home (Oxford)

The New York State Women's Relief Corps Home is located on the Chenango river about one mile northeast of the village of Oxford, in Chenango county. The D., L. and W. R. R. traverses the northwesterly boundary of the grounds and the Ontario and Western railroad passes through the opposite side of the grounds. The buildings, consisting of the main group, composed of cottages A, B, C, D and the hospital, all of which are connected by corridors and which extend over a distance of nearly 1,000 feet; also various other accessory buildings, including barns, storehouses, etc., are situated on an elevated plateau overlooking the Chenango valley. The institution owns 103½ acres of land, most of which is used for agricultural purposes.

The object of the institution is to provide a home for aged dependent veterans and their wives, veterans' mothers, widows and army nurses, who are residents of New York State. The average age of those at the institution is about 73 years. The average population is approximately 185 inmates and 46 employes, making a total of 231.

This institution was made the subject of a special investigation on June 20 and 21, 1914. As a result of this investigation it is found that certain insanitary conditions existed at the institution, in consequence of which the following conclusions and recommendations were made in a detailed report:

Conclusions and Recommendations

"(1) That in view of the possible pollution of the water supply by stock in the vicinity of the springs:

(a) The springs be properly protected by fences inclosing them, and by drainage ditches to eliminate surface wash from the pasture land.

(b) The auxiliary supply from the D., L. & W. R. R. tank now being used, be abandoned and another supply of sufficient quantity and satisfactory quality obtained.

(2) That a sink be provided in the serving room adjoining the dining room on the second floor of the hospital.

(3) That, in view of the insanitary method of disposal:

(a) The institutional authorities at once take the necessary steps to have plans prepared and secure an appropriation for the construction of a sewage disposal plant for the proper treatment of the sewage before discharging it into the Chenango river and that the plant be constructed and put in operation as soon as possible.

(b) The bottom of the catchbasin receiving the domestic sewage from the hospital be reconstructed with an open channel on grade so that no obstruction is offered to the flow of the sewage.

(c) The storm water from the hospital, discharging on the ground, be either continued to the river or connected with the sewer which discharges into the river and thus eliminate the discharging of storm water on the surface of the ground.

(4) That, regarding bathing, better supervision be provided in order that the inmates shall have the necessary number of baths at regular intervals.

(5) That, in view of the urgent need of an elevator, steps be taken by the institutional authorities to at once provide such elevator for the hospital.

(6) That, in view of lack of opportunity for the inmates to have their eyes properly examined and treated, the authorities of the institution at once make the necessary arrangements and obtain the services of an opthalmologist."

Syracuse State Institution for Feeble-Minded Children
(Syracuse)

The Syracuse State Institution for Feeble-Minded Children is located in the western part of the city of Syracuse, Onondaga county. The grounds are bounded on the north and west by Burnet park, on the east by Wilbur avenue and on the south by Grant avenue. There is, however, a farm belonging to the institution located near Fairmont Station, about 4½ miles northwest of the institution proper. The main group of buildings consists of the administration building, laundry, hospital, garden cottage, barns and other minor structures. They are pleasantly situated on rising ground at an elevation of about 480 feet above sea level.

The object of the institution is to furnish the means of education to that portion of dependent feeble-minded youths of the State not provided for in any of the other educational institutions. The class of children received, therefore, are those who are so mentally deficient as to render them incapable of being educated in the common schools, children who are not epileptics, paralyzed, helpless, insane or greatly deformed and who are between the ages of 7 and 14 years. At the time of the inspection the enrollment was 574 inmates, in addition to which there were 121 employes, making the total population of the institution 695.

An inspection was made of this institution on July 3 and 6, 1914. As a result of this inspection certain insanitary conditions were found to exist. In a detailed report on the investigation were recorded the following conclusions and recommendations:

Conclusions and Recommendations

"(1) That, in view of the unsatisfactory condition of the ceilings in some of the dormitories, the plastering in all buildings be repaired at once where such repairs are needed.

(2) Although from a sanitary standpoint the general water supply at Fairmont farm is reasonably satisfactory it would seem necessary for a public institution with the large amount of property involved to have adequate fire protection for all its buildings. In view of this consideration and also in view of the insanitary condition of the well at the teamsters' cottage the following recommendations may be made:

(a) That the institutional authorities consider carefully the problem of fire protection and take such steps to provide adequate water supply at the farm for this purpose as may be found necessary.

(b) That the well at the teamsters' cottage be placed at once in a sanitary condition and carefully protected from possible contamination.

(3) In view of the unsatisfactory condition of the plumbing in certain respects:

(a) That the necessary repairs be made to eliminate leaks causing water in the old battery room under the boys' building and that the necessary drains be put in to eliminate the water from the main basements in the same building.

(b) That all plumbing fixtures not properly provided with vents be so provided.

(c) That dormitories not provided with toilet and bathing facilities be so provided in order that more adequate and evenly distributed facilities in this line will be available.

(4) That in view of the possibility of disease being caused by infection from the privies at the farm under present conditions a[illegible] out in this and also in the report on the investigation [illegible] the institution heretofore referred to, the privies be [illegible] proper system of sewage collection and disposal fo[illegible] buildings be substituted.

(5) That in view of certain unsatisfactory conditions of the heating system:

(a) Extensive repairs be made in the steam lines throughout the institution at once.

(b) An auxiliary boiler should be provided.

(6) That adequate fire protection apparatus be provided at Fairmont farm.

(7) That since it is evident from the investigation that the light is inadequate in some of the school rooms, the use of these rooms for this purpose be discontinued and others with satisfactory light be provided, or that the necessary improvements be made to furnish satisfactory light for those being used.

(8) That since flies were more or less prevalent in some of the dining rooms and kitchens because of inefficient screening, all window and door screens in the dining rooms and kitchens which have holes in them or do not fit the frames properly be replaced with new screens which fit the frames properly, and in case of doors also provided with suitable springs.

(9) That children when entering be kept isolated until the results of the analyses of the throat cultures are received and that when these results are reported positive they be detained in quarantine until negative results are obtained."

Watkins Glen Reservation (Watkins)

Watkins Glen is situated in Schuyler county near the southern end of Seneca lake, the entrance to the Glen being in the southern part of the village of Watkins, about one-half mile from the New York Central railroad station. The reservation extends in a westerly direction for about 1½ miles, Glen creek flowing through the center of it. The Glen in reality is a crevice or gorge in the rocks, caused by the erosion of the stream, it being about 250 feet deep near the center. The buildings consist of an open pavilion as the entrance and two ladies' and two men's toilets further up the Glen. The grounds, which consist of 103½ acres, are well provided with walks, guard rails, etc.

Although no definite data are available as to the number of people visiting the Glen during the season, it is quite apparent that it has become a very popular resort, the inspector being informed that during some days in the summer several thousand visitors pass through the Glen.

An inspection was made of Watkins Glen reservation on July 13, 1914. Although the general conditions appeared to be quite satisfactory there were certain insanitary conditions which should be corrected, in view of which the following conclusions and recommendations were made in a detailed report:

Conclusions and Recommendations

" (1) That, since it is evident there is insufficient shelter for visitors in case of storm, a shelter pavilion be provided near the center of the Glen.

(2) That the area in the vicinity of the collecting mains of the main water supply be properly enclosed and protected, by means of a high and substantial wire fence, to prevent any possibility of contamination by people trespassing.

(3) That, if the nuisance caused by the dumping of garbage on land adjoining the park is not immediately abated, the park authorities take the necessary steps to bring about the elimination of the insanitary conditions existing.

(4) That sufficient light be provided in all tunnels to avoid the possibility of accidents."

Hospital for the Care of Crippled and Deformed Children (West Haverstraw)

The Hospital for the Care of Crippled and Deformed Children is located about one mile from the Hudson river and about one-half mile northwest of the West Haverstraw station on the West Shore railroad, in the county of Rockland. There are eight buildings, consisting of an administration building, solarium, isolation building and other buildings of less importance. The buildings are located on elevated grounds where the drainage is, in general, satisfactory.

The object of the institution is to furnish proper care and treatment of dependent children who are residents of New York State and who are crippled or deformed or are suffering from diseases from which they are likely to become crippled or deformed. The ages of the children at the institution range from 4 to 16 years. At the time of the inspection there were 70 inmates present.

As a result of an inspection made of this institution on June 17, 1914, a report stating in detail the conditions contained the following conclusions and recommendations:

Conclusions and Recommendations

"(1) That, although the buildings are in a fair state of repair and a good sanitary condition, they are generally inadequate for the needs of the institution and, therefore, new buildings or additions to the present ones should be constructed, to eliminate the overcrowding in the wards, officers' and employes' quarters, storage, kitchen and laundry.

(2) That, as recommended in the 1910 report, 'although the water supply of the institution now furnished by the Haverstraw Water Company is generally of satisfactory quality and is now protected by rules and regulations enacted by this Department, which, if enforced by the water company, would make the water more uniformly satisfactory, it is shown by the analyses to be of unsafe quality and unless the supply is improved and made uniformly safe in quality, the question of securing a new and independent supply of unquestionable purity should be seriously considered.'

(3) That a sewage disposal plant for at least partial treatment of the sewage, plans of which should be submitted to this Department for approval, be constructed.

(4) That, owing to the uncertain quality of the milk being furnished the institution and the difficulty of controlling the conditions under which it is produced:

(a) The milk now being used be pasteurized with a pasteurizer of modern type and, further, that the institutional authorities request the Agricultural Department to regularly inspect all the dairies and herds at any time furnishing milk for the institution.

(b) That, in lieu of the above and as a better and more economical solution of the problem the institution provide its own herd, which should be tested by the Department of Agriculture to insure its being free from tuberculosis and, further, that such herd, if purchased, be frequently tested thereafter to insure the maintaining of a tubercular free herd.

(5) That, in view of the uncertainty regarding the analyses of throat cultures of children entering the institution, the institutional authorities ascertain whether such analyses are made prior to entering and, if not, that throat cultures of the patients be taken upon arrival, that they be held in quarantine until the results of the analyses are heard from and, further, that when the results are reported positive the patients be held in quarantine until negative results are obtained."

Willard State Hospital (Willard)

The Willard State Hospital is located on the east shore of Seneca lake, in Seneca county, about half way between the village of Watkins and the city of Geneva. The institution owns 1,204 acres of land, which extends back about 1½ miles from the lake shore. The buildings, including eight large structures containing wards for the patients and also some 72 other buildings, such as shops, power house, barns, etc., or a total of 80, are located in several different groups distributed over this area.

The hospital cares for all classes and ages of insane except the criminal insane. The number of inmates present on June 10, 1914, was 2,387, the number of employes 491, thus making a total population at the institution of 2,878.

An inspection of the institution on June 11 and 12, 1914, brought out the fact that certain unsatisfactory conditions existed, in consequence of which, after a careful study of the situation, the following conclusions and recommendations concerning sanitary improvements were made in a detailed report:

Conclusions and Recommendations

" (1) That, in view of certain insanitary conditions existing in some of the buildings and about the grounds:

(a) The necessary improvements or repairs be made to eliminate the dampness from the basement at Sunnycroft.

(b) The cow barn, which has insufficient air space and ventilation, referred to in detail in this report, be raised and remodeled so as to meet all sanitary requirements for such building, or that the use of the barn for milch cows be discontinued.

(c) The present floor in the slaughter house be either reconstructed or repaired and, also, that the slaughter house be adequately provided with drains so that the floor can be properly cleaned and flushed.

(d) More sanitary conditions be maintained in the vicinity of the piggery and slaughter house.

(2) That, in view of the probability of the main water supply being of an unsafe quality at times and of the evident pollution of the wells being used for drinking water supplies:

(a) A water purification plant, to purify the water supply now being pumped from the lake, be constructed and put in operation.

(b) The use of the wells referred to in detail in this report, now furnishing drinking water at some of the buildings be abolished.

(3) That the common drinking cups be eliminated and drinking fountains or some other sanitary method adopted.

(4) That, in view of the evident neglect in the operation of the sewage disposal plant:

(a) Greater vigilance and care be exercised in the operation of the sewage disposal plant.

(b) That a sufficient amount of hypochlorite to furnish at least 10 parts per million available chlorine be used for sterilizing and, further, that the amount of the hypochlorite used be weighed and records kept of the amounts used.

(5) That, since it is evident that some portions of the institution are improperly ventilated:

(a) Satisfactory means of ventilation be provided for the kitchen in Chapin house.

(b) In those buildings drawing their supply of fresh air from the basements the necessary changes be made to draw the supply directly from outside the buildings.

(6) That a new boiler be provided for the steam fire engine and that any other necessary repairs be made to put it in condition for service in case of fire.

(7) That, regarding the milk supply:

(a) Aerators be provided for cooling the milk at the dairies.

(b) A steam sterilizer be provided for sterilizing the milk cans and pails at the dairy.

(8) That modern dishwashers with an abundant supply of hot water be provided instead of the present method of washing the dishes by hand.

(9) That, since there is the possibility of infection from entering inmates who are diphtheria carriers, throat cultures be taken of all patients when they enter; that the patient be kept isolated until the results of the analyses are reported; and that when the results are positive the patients be retained in quarantine until negative results are obtained."

INVESTIGATION OF SEWAGE DISPOSAL PLANTS

In this State there are at present in operation some 200 municipally and privately operated sewage disposal plants of varying degrees of extent of purification, some of which have been known from investigation not to be operating with their original or intended efficiency. Owing to the necessity of obtaining more definite knowledge in this respect a special investigation of all of the plants of the State was undertaken in 1914.

These investigations include in each case a careful inspection of every feature of the plant, its method of operation, character of effluent and effect upon the stream into which the effluent is discharged. To assist in the study of its efficiency samples of sewage and effluents are taken from different parts of the plant and analyzed by the Assistant Engineer in the field by means of a portable field laboratory. The data are later studied and collated, and a report covering the results of the investigation with recommendations for any improvements is prepared and transmitted to local authorities. Although this work was not undertaken until late in the year the following plants have been investigated, reported upon and the reports with recommendations transmitted to local authorities:

Brockport
Central Square (Creamery)
Hobart
Hobart (Creamery)
Middleport
Newark (Creamery)
Newark
Saratoga Springs
Stamford
Westfield
White Plains.

Abstracts of the reports on the above plants follow.

BROCKPORT

The village of Brockport is located in Monroe county and is about 10 miles inland from Lake Ontario and 17 miles west of Rochester. The population according to the U. S. census in 1910 was 3,579 and the population at the time of the investigation was estimated at about 3,600.

The public water supply is taken from Lake Ontario and is purified by a mechanical filtration plant comprising three Jewel filters. The supply is a municipal one and serves about 75% of the inhabitants of Brockport and also some of the residents of the small villages of Clarkson and Hamlin. The average daily water consumption was estimated at about 320,000 gallons per day, which corresponds approximately to 100 gallons per day per capita.

The sewer system comprises about 14 miles of sanitary sewers ranging in size from 8 to 15 inches. This sewer system serves about 60% of the population and at the time of the investigation the amount of sewage flowing to the disposal works approximated some 222,000 gallons per day, which corresponds to an average flow of about 103 gallons per capita per day.

The disposal works consist of a settling tank, dosing chamber, 4 primary contact beds and four wave filters. The plant is located in the town of Clarkson, about 1½ miles northeast from the center of Brockport.

The plant was investigated on August 6, 1914, and a copy of the report was sent to the village authorities of which the following conclusions and recommendations were a part:

Summary and Conclusions

"As a result, then, of the investigation of this plant, and after careful consideration of the condition of operation and the results of analyses of samples from the various parts of the plant and of the condition of the stream into which the effluent is discharged, the following summary and conclusions are presented:

(1) Due to the active septic action taking place in the settling tank and possibly also to the accumulation of sludge very little sedimentation of suspended matter was being accomplished.

(2) Due to the fact that two of the contact beds were not being used, to the fact that the automatic siphons of the two beds in use were not operating properly and to the fact that the sewage flowed continuously through the two beds without any aeration or period of contact very little purification was being accomplished by the contact beds.

(3) As a result of two of the contact beds being in use, only two of the wave beds were in use and in these the sewage flowed as in the case of the contact beds continuously through and over the wave beds with practically no additional purification.

(4) That the plant as a whole, was out of repair; was not being operated in accordance with its intended design; was apparently badly neglected and as a general result was giving a very low efficiency of operation and turning out a very poor and unsatisfactory effluent.

(5) As a result of the low efficiency of the plant and the poor quality of the effluent from the plant a serious pollution of the stream into which the effluent is discharged was created as shown by the putrescibility of the water and the growths and deposits of sewage fungi in and along the brook below the point of final discharge.

(6) The plant as a whole, though somewhat obsolete, was well designed and if placed in proper repair or condition and operated carefully and intelligently should give a stable effluent, one that should remove the insanitary conditions that now exist in and along the brook below the plant.

Recommendations

In view of the above conclusions, I recommend that the attention of the village authorities be called to the neglected condition of this sewage disposal plant, to its unsatisfactory and inefficient operation and to the resultant serious pollution and nuisance in the stream into which the effluent from the plant is discharged; and that they be required to proceed at once to thoroughly overhaul the plant and its various appurtenances and apparatus, to clean thoroughly the tank, contact beds and wave beds; and to otherwise make such repairs, alterations or additions as will enable the plant to be properly operated in the manner and with the efficiency that a plant of this type is designed to be operated, to the end that the nuisance now created in the stream may be speedily abated.

I further recommend that the attention of the village officials be called to the provisions of section 76-A of the Public Health Law and that they be required to carry out the above recommendations without delay."

CENTRAL SQUARE (Cooke Milk & Cream Company's Creamery)

This creamery is located at the Central Square station in Oswego county at the junction of the New York, Ontario and Western R. R. and the New York Central and Hudson River R. R.

At this creamery from 6,000 to 13,000 lbs. of milk are daily received. During the greater part of the year all milk received is shipped direct to New York City, although during a portion of the spring months the cream is separated and shipped away and the casein is precipitated out of the skimmed milk and shipped to Bainbridge. The wastes from the creamery, therefore, consist of wash water during the entire year and for a part of the spring months whey is also a waste product. The volume of wastes varies from 500 gallons a day during the greater part of the year to about 2,000 gallons a day during the time that the whey is included in the wastes.

The disposal plant consists of a diverting chamber, 2 settling or chemical precipitation tanks and 2 sprinkling filters. The plant is located near the railroad track adjacent to the creamery.

The plant was investigated on September 5, 1914, and a copy of the report, of which the following conclusions and recommendations are a part, was sent to the Cooke Milk and Cream Company:

Summary and Conclusions

"As a result of the investigation of this plant and after a careful consideration of the conditions of operation, of the results of analyses of the effluent and of the condition of the stream into which the effluent is discharged, the following summary and conclusions are presented:

(1) That the discharge of whey into the plant is in violation of the permit and should be discontinued.

(2) That the application of the chemicals is not carried on at the plant as it was intended inasmuch as the common washing soda is not used all the year.

(3) That the pipe which drains the wastes from the settling tanks has its suction resting on the bottom and as the wastes are being pumped out any sludge near the pipe is also improperly pumped out and discharged onto the sprinkling filter.

(4) That the old cesspool is probably full of sludge and part of this sludge is flushed out each day and discharged into the brook.

Recommendations

In view of the results of this investigation, I would recommend that the Cooke Milk & Cream Co. be required to make the following changes in the construction and operation of this disposal plant in order that a better effluent may be obtained.

(1) That the whey be properly disposed of otherwise than by discharging it into the disposal works, as required by the permit.

(2) That common washing soda be used during the entire year with the lime and applied to the wastes in the diverting chamber.

(3) That the suction end of the pipe through which the settled wastes are withdrawn from the settling tank be raised not less than one foot and the tank so operated that the sludge is not pumped out and discharged onto the sprinkling filters.

(4) That the old cesspool near the outlet be cleaned out and converted into a settling chamber in order that settlement may be provided for the effluent of the sprinkling filter."

HOBART

Hobart is an incorporated village in Delaware county located in the valley of the west branch of the Delaware river. The Ulster and Delaware railroad passes through the village. The population of the village has not changed materially in recent years, and at the time of the inspection there were about 544 inhabitants.

The public water supply is furnished to the village after filtration by the Hobart Water Company. It is a gravity supply and the intake is about 4 miles southeast of the village. Practically all the inhabitants are served by this supply.

There are about 4 miles of sewers ranging in size from 6 to 12 inches. Practically all of the population are served by the sewer system. The amount of sewage flowing as estimated on the day of inspection was about 100,000 gallons per day of which one-half to three-quarters was estimated as trade wastes from a local creamery.

The disposal works are located on a coarse gravel bed, three quarters of a mile west from the center of the village on the south bank of the Delaware river. These works consist of 2 settling tanks, 2 dosing tanks, 6 sand filters and a sludge bed.

The plant was investigated on July 22 and 23, 1914, and a copy of the report, of which the following conclusions and recommendations were a part, was sent to the village authorities:

Summary and Conclusions

"As a result of the investigation of this plant and after a careful consideration of the conditions of operation, the results of analyses of effluent from the plant and the conditions of the stream into which the effluent is discharged, the following summary and conclusions are presented:

(1) The condition of the siphon under the river was defective and extensive repairs will be necessary to put it in proper operating condition.

(2) The sedimentation tanks were nearly full of sludge and scum and were not doing their proper work. Considerable larvæ of the fly were found in the scum.

(3) The sand filters were not in proper condition for effective filtration of the effluent from the tanks. The sludge on the sand beds was filled with larvæ and on digging into the sand considerable of the fly larvæ and pupæ were found on the three beds not in use. The sewage seems to flow over the surface of the sand out to the embankment and down through the coarse gravel to the drains and comes out unpurified. The sand in the filters, although rather fine, is nevertheless, of good effective size and has a fair uniformity coefficient.

(4) The general condition of the plant was very unsatisfactory and there was an exceedingly strong burnt caramel odor around the plant which was very disagreeable. The scum on the tanks and sand beds resulting largely from the milk wastes seemed to maintain its moisture and the vast number of maggots gave it an exceedingly filthy appearance.

(5) These disposal works were designed and built to care for the sanitary sewage of the village and it was thought by the Designing Engineer that the amount of trade wastes from the creamery would be about 4,000 gallons. The plant is of ample size to treat the sanitary

> sewage and 4,000 gallons of trade wastes, but since the plans were approved the creamery has increased its force considerably and presumably has increased its output. At any rate the amount of trade wastes now being discharged into the village sewers varies from 30,000 to 50,000 gallons per day.

It has been pointed out above that the wastes from the creamery, discharging into the village sewer system and disposal plant have affected and seriously interfered with the proper operation of the plant since its construction. Application has recently been received, however, from the Sheffield Farms-Slauson Decker Company for a permit to discharge effluent from treatment works to dispose of these creamery wastes. This company is at present employing a consulting firm to design such disposal works and the consulting firm has been advised by the Department that consideration will be given to the issuance of a permit to discharge, directly into the river, the effluent from a plant to treat the wastes from the creamery.

In view of this fact and assuming for the present that future considerations will not require that effluent or wastes from the creamery be discharged into the village sewer system, the following recommendations are made on the basis that none of the creamery wastes will reach the village disposal plant.

Recommendations

I would recommend that the village of Hobart be required to arrange for the following changes in the construction and operation of the plant in order that a higher efficiency may be secured.

Inverted Siphon West Main Street:

(1) That the chamber be provided with a tight cover to prevent the escape of odors.

(2) That the chamber be cleaned out and the siphon be put in operating condition.

(3) That the siphon pipe be made tight so that the sewage will reach the disposal works.

Settling Tanks:

(1) That all sludge and scum be removed from the tanks and buried in trenches or otherwise so disposed of as not to cause a nuisance. Burying is recommended on account of the odors, the presence of fly larvæ, the ability of the sludge to retain moisture which prevents its drying up.

(2) That both tanks be used continuously while the sludge and scum be removed at frequent intervals so as to keep the plant in a fresh condition.

Dosing Tanks:

That the automatic siphons be overhauled and put in working condition and that the total capacity of the dosing tanks be discharged at one time with the siphons working alternately.

Sand Filters:

(1) That all sludge be removed from the surface of the bed and buried.

(2) That embankments around the beds be replaced with sand of the same size as that used for the beds so that starting at the top of the slope and descending the slope there will be at each point a vertical depth of 3 feet of the sand or that some other method be used which will make the embankments equally impervious to the sewage.

(3) That the gate manhole between the four sand filters be divided so that each siphon can discharge to any of these beds and that effluent from the dosing tanks be discharged alternately by the two siphons on to not less than two beds at each discharge of a siphon.

(4) That whenever a bed shows a tendency to hold the sewage on the surface too long, it should be put out of service long enough to allow the scum to dry and be removed.

(5) That the beds and grounds be kept in a clean and fresh condition.

(6) That sufficient labor be employed to maintain the disposal works in proper condition.

The improvements in constructive and operative features of the plant as required under the above recommendations are essential to proper operation of the plant and should be made at once. It should be stated also that if, at a later date, it is deemed advisable to require that either the wastes from the creamery or the effluent from the works to treat such wastes be discharged into the village sewer system and sewage disposal plant, that increased capacity of the village disposal plant will at such time be necessary and the question of proper enlargement of such plant would at such time be taken up by this Department with the village authorities."

HOBART

(Experimental Plant at Slauson-Decker Sheffield Farm's Creamery)

At this creamery, milk which is received either from local farms or from neighboring receiving stations is either shipped to New York City or converted into butter, milk powder, casein, albumen and milk sugar. This disposal plant at this creamery, was constructed for experimental purposes by the Moore Filter Company of New York City and consists of a chemical precipitation tank and a vacuum canvas filter. The plant was located in the building adjacent to the creamery and was capable of treating but a small portion of the total trade wastes.

The plant was investigated on September 10, 1914, and a copy of the report, of which the following conclusions were a part, was sent to the Slauson-Decker Sheffield Farm's Company:

Summary and Conclusions

"From a careful study of the operation of the plant and the results of the analyses the following partial conclusions are presented which may be changed by further investigation along these lines:

(1) It would appear from the first run that final filtration is required to give at all times a clear effluent and to reduce the total nitrogen.

(2) That the coating of "Mud" of the canvas filter gives a better effluent and should be used.

(3) That the final effluent might be discharged into the brook to see if any pollution, putrefaction or other harmful action is caused and if so then the final wastes could be discharged into the sewer as at present.

(4) All turbidity is removed by the plant and sludge removed is easily handled but will putrefy in a short time, and should be removed from creamery and disposed of so as not to cause a nuisance.

Additional Conclusions Drawn from Analytical Results

(1) Suspended solids in creamery wastes are not in such condition as to settle out readily and are probably chiefly in colloidal form.

(2) That the addition of iron sulphate and lime causes a precipitate, which on settling will carry down a considerable amount of suspended solids as shown by the reduction of turbidity after such a process.

(3) That the effect of the settling out of the colloidal solids upon the nitrogenous contents cannot be determined from these results as no nitrogen tests were made of the settled effluent before filtration except for the first run in which sedimentation was very incomplete. The other runs gave a fairly clear settled effluent and possibly some reduction was brought about by the removal of the suspended solids.

(4) That the filtration of the settled wastes gives a perfectly clear effluent.

(5) That the results as to putrescibility are conflicting and thus prevent the drawing of definite conclusions as to the efficiency of the process in that respect. It is possible that the addition of iron sulphate and lime together with the lactic acid already present, brings about the production of the H_2S which causes the decolorization of the methylene blue. It should be noticed in the first run on September 10 that the wastes treated with Fe SO_4 alone and the final effluent of the second run on September 11 when the filter was not covered with the "mud," held up for 7 days. This may be due to the disinfecting action of the Fe SO_4 or to the absence of the reduction of the Fe SO_4 by the lime and lactic acid. There is also the further possibility of the interference by organic acids and sugar with the methylene blue test."

MIDDLEPORT

Middleport is an incorporated village in Niagara county on the Niagara Division of the N. Y. C. & H. R. R. R. and is about 12 miles from Lake Ontario. The population has remained about the same for the last few years, the number being about 1530 at the time of the inspection.

The public water supply is obtained from three springs located about three miles southwest of the village. It is a municipal supply and the water is pumped into the distributing main and used without filtration. About 33% of the inhabitants are supplied with the water.

The sewer system consists of about 8 miles of sanitary sewers ranging in size from 6 inches to 15 inches. This sewer system serves about 37% of the population. The amount of sewage flow on the day of inspection was about 39,000 gallons per day. This corresponds to a daily per capita flow of about 70 gallons.

The sewage disposal works are located about 1¼ miles north of the village on the right bank of a small brook. The works consist of a radial flow Imhoff tank, a dosing chamber, 8 sprinkling filter units and a sludge bed.

The plant was investigated on August 5, 1914, and a copy of the report, of which the following conclusions and recommendations are a part, was sent to the village authorities.

Summary and Conclusions

"As a result of the investigation of this plant and after a careful consideration of the condition of operation, of the results of analyses of the different effluents of the plant and of the condition of the stream into which the effluent is discharged the following summary and conclusions are presented:

(1) The Imhoff tank was giving a good reduction of the suspended solids as shown by the total oxygen consumed determinations, the reduction amounting to about 37%. Since no sludge has ever been removed from the digesting chamber, some of it might be removed to advantage.

(2) The benefit to the plant of a properly operating dosing tank is lost and the net result is to produce an effluent not of a sprinkling filter but, in fact, from coarse strainers which give hardly any purification and which are liable to become clogged. The sprinkling filters are apparently well designed and should give a good effluent but instead were giving a very poor effluent as the result of overloading of the filter and of the continuous flow of sewage from the dosing tank to the filter under a low head.

Recommendations

In view of the results of this investigation, I beg to recommend that the village of Middleport be requested to make the following changes in the operation of the plant.

(1) That the sludge pump be replaced as soon as possible and part of the sludge in the digesting chamber be pumped to the sludge drying bed

and that the scum in the sludge and settling compartments be removed at frequent intervals.

(2) That arrangements be made to have the siphon in the dosing chamber properly adjusted.

(3) That the entire sprinkling filter be kept in operation."

NEWARK

The village of Newark is located in Wayne county about 30 miles east of Rochester and 16 miles from Lake Ontario. There has been a steady increase in the population of the village in recent years, the number of inhabitants being 4,554 in 1905, while at the time of the inspection the number was estimated at about 6,700.

The public water supply is obtained from wells and springs located about 2 miles northeast of the village. It is a municipal supply and the water is furnished without filtration to about 80% of the inhabitants. The average daily consumption for the year 1913 was 380,000 gallons which would correspond to an average daily consumption per capita or about 75 gallons.

The sewer system consists of about 16 miles of sanitary sewers ranging in size from 6 to 18 inches. This sewer system serves about 30% of the inhabitants of the village. The sewage from the Newark Custodial Asylum is also cared for in the village sewer system and sewage disposal plant. The amount of sewage reaching the disposal works on the day of inspection was about 552,700 gallons, which corresponds to an average flow per capita of about 197 gallons. The disposal plant is located in the village about half way between the tracks of the N. Y. C. & H. R. R. R. and of the West Shore R. R. near Murray street. These works consist of an open screen and grit chamber, a radial flow Imhoff tank, a pumping plant, a dosing chamber, a sprinkling filter and a final settling chamber. Sludge beds are also provided.

The plant was investigated on September 3, 1914, and a copy of the report, of which the following conclusions and recommendations are a part, was sent to the village authorities.

Summary and Conclusions

"(1) The screen and grit chamber are operating properly but do not have much effect on the sewage since only sanitary sewage is received at the plant.

(2) The Imhoff tank is operating effectively with the weak sewage contributed to it although the scum on the digestion chamber could be removed to advantage.

(3) The pumping station is kept in good condition but in the operation there are two features of construction and operation provided for by the plans which are not being adhered to. This departure from the plans results in:

(a) Intermittent pumping to the dosing tank, giving very poor distribution to the filters.

(b) Allowing the sewage to overflow and by-pass the filters while sludge is being pumped to the sludge bed.

(4) The capacity of the siphon on the dosing tank is about reached under conditions of steady flow and under the condition of intermittent flow the siphon will not break which causes the greater part of the sewage to be applied to the filters under a small head.

(5) The sprinkling filters are in good condition and give a fair effluent even under the poor conditions of distribution.

(6) With the exception of the putrefying sludge in the bottom of the tank the final settling chamber was being properly operated.

(7) The discharge of the effluent into a stream from which water is taken for drinking purposes is decidedly dangerous and the sterilization plant should be installed as provided for by the plans.

Recommendations

In view of the results of this investigation, I would recommend that the village of Newark be required to make the following changes in construction and operation of the disposal plant in order that it may be operated more efficiently and give a sterilized effluent at all times.

(1) That the sterilization plant be installed to sterilize the effluent from the sprinkling filter and that a pipe be carried to the overflow opening to be used in case the pumping plant breaks down.

(2) That proper operation of the pumping station be maintained in order that no untreated sewage be discharged into the brook even at times of pumping sludge.

(3) That the uneven distribution of settling tank effluent over the sprinkling filter be corrected by making the necessary change in the operating apparatus so that the siphon will break during the operation of the pump. It might be possible to secure this result by one of the following methods although sufficient study should be made to determine an efficient method to secure the result desired.

(a) Raising the lower bend in the Harding vent until the siphon will break.

(b) Raising the bell and rearranging the piping to suit conditions.

(c) Placing resistance on electric current so that motor will operate at a lower speed.

(d) Installing a larger siphon.

(4) That the final settling tanks be so operated that sludge from final settling tank is removed whenever gas is seen rising to surface."

NEWARK (Creamery)

An investigation of the conditions existing at the creamery of the Newark Cream Co. was made at the request of the Superintendent of the Water, Light and Sewer Commissioners of Newark, Wayne county. The investigation was made with a view of determining the practicability of discharging the creamery wastes into the village sewer system. The investigation was made on September 3, 1914, at the time of the investigation of the sewage disposal works of the village.

From 10,000 to 25,000 lbs. of milk per day are received at the creamery and the milk is either sold as milk or the cream separated and shipped away or made into butter and cottage cheese. The wastes consisting largely of wash water were being discharged into an open ditch in the rear of the factory.

As a result of the investigation, a copy of the report, of which the following conclusions and recommendations are a part, was sent to the village authorities:

"In view of the fact that the wastes water and washings from the creamery would constitute a relatively small proportion of the total sewage to be treated in the village disposal works even with allowance made for the greater organic content of these wastes as compared to that of domestic sewage, I would recommend that the village authorities allow these wastes to be discharged into the sewers of the village under the following conditions:

(1) If the creamery wastes be found at any time to overtax the disposal plant so as to prevent its proper operation or to cause a nuisance that the village require the Newark Creamery Co. to provide either partial or more complete treatment of the wastes before their discharge into the sewer system.

(2) That no skimmed milk, buttermilk, whey or other highly organic matter be discharged from the creamery into the sewers."

SARATOGA SPRINGS

The village of Saratoga Springs is located in Saratoga county about 40 iles north of Albany and 11 miles west of the Hudson river. It is very pular as a watering place and as a health and summer resort. The per- anent population has remained practically the same for the last few years, e number being about 12,700. The total summer population will vary from ,000 to 50,000.

The public water supply is taken from Loughberry lake, located in the rtheast portion of the village. This is a municipal supply and the water pumped direct from the lake into the mains and used without any purifica- on. The average consumption as determined at the pumping station varies om 3,500,000 to 4,000,000 gallons per day during most of the year, while e minimum consumption is as low as 3,000,000 gallons. Practically all of e population are served by this water supply.

The amount of sewage reaching the disposal plant as obtained from the cords at the plant, averages about 1,050,000 gallons per day for the last 12 onths.

The disposal works are located about 2 miles east of the village and well ove the brook into which the effluent is discharged. The works consist of settling tanks, an aerator, 2 dosing chambers, 18 sand filters and 2 sludge ds. All sewage has to be pumped from the sewer system to the disposal orks.

A copy of the report, of which the following conclusions and recommenda- ons are a part, was sent to the village authorities, following the investiga- on of the plant which was made on July 14, 1914.

Summary and Conclusions

"As a result of the investigation of this plant and after a careful considera- on of the conditions of operation of the works, of the condition of the ream into which the effluent is discharged and of the results of analyses of e effluent from the plant, of the water overflowing from the 36-inch sewer nd of the water in the stream the following summary and conclusions are resented:

(1) There are probably several combined sewers of the village connected to the old 36-inch sewer from which the sewage does not reach the pumping station but flows into the brook or creek.

(2) The plans for the pumping station were revised to conform to the requirements of this Department and, in order to prevent at all times any overflow of sewage at the station, the pumps were to work automatically so that with an additional amount of sewage flowing more of the pumps would be placed in operation. At the first visit to the station but one pump was connected up and about half of the sewage being received was overflowing into the 36-inch sewer.

(3) The capacity of the pumps is sufficient to pump all of the sewage received when the three pumps are in use, but when any of the pumps are shut down for repair part of the sewage overflows into the storm water sewer.

(4) During heavy storms the storm water in the old 36-inch sewer backs up into the pumping station where it mixes with the sewage and flows out over the marsh to the brook.

(5) The defective condition of the old overflow causes the sewage and storm water to overflow and produce a serious pollution of village brook.

(6) The septic tanks were operating satisfactorily without excessive scum or sludge being formed.

(7) The aerating device gave the effluent of the settling tank 3.7 parts dissolved oxygen before it is discharged on the sand beds which undoubtedly assisted in its purification in the sand filters.

(8) The sand beds are in good shape although the three bed unit has to be scraped oftener than the others.

(9) The effluent from the disposal works was as clear as spring water and in much better condition than the brook into which it flowed.

Recommendations

In view of the results of this investigation I would recommend that the village of Saratoga Springs be required to make the following changes in construction of the sewer system and disposal works in order that the pollution of village brook and Kayaderosseras creek may be stopped.

(1) That all the sanitary sewage of the village be removed from the old 36-inch sewer and conveyed to the pumping station.

(2) That all the sewage received at the pumping station be pumped to the disposal works and that none of it be allowed to flow into the 36-inch sewer or brook.

(3) That stop planks, flap valves or other means be provided to prevent the storm water from the 36-inch sewer backing up and overflowing into the pump well.

(4) That the pumping machinery be brought to a higher efficiency or that an additional pump be provided so that when one of the pumps is not operated or is shut down for repairs this will not result in a portion of the sewage overflowing.

(5) That a slight rearrangement of the piping at the siphon to the sand filters be made in order to give a minimum unit of four sand beds and thus provide for more uniform application of the effluent from the settling tanks. This would provide for increased efficiency of the plant and allow a greater amount of sewage to be treated if necessary at a later date."

STAMFORD

Stamford is an incorporated village in Delaware and Schoharie counties located near the head waters of the Delaware river. The Ulster and Delaware railroad passes through the village. The permanent population of the village has not varied materially in recent years, and the number has remained at about 970. The summer population is much larger since there are about 2,000 additional at that time.

The public water supply is furnished by a private company and the water is taken from the Delaware river about 2½ miles north of the village. The water is delivered to the village by gravity after first passing through pressure filters. Practically all of the population is supplied with this water.

The sewer system consists of about 3 miles of sanitary sewers ranging in size from 8 to 12 inches. This system serves about 95% of the inhabitants. The amount of sewage flowing on the day of inspection was about 218,000 gallons per day which would correspond to about 100 gallons per day per capita. The maximum flow for part of August would probably be about 300,000 gallons per day, while for the winter months the average flow would be about 100,000 gallons.

The disposal plant is located immediately west of the main part of the village and is within about 500 feet of one of the main streets. The works consist of 2 sedimentation tanks which were originally designed as chemical precipitation tanks but of recent years no chemicals have been used.

The plant was investigated on July 23, 1914, and a copy of the report of which the following conclusions and recommendations are a part, was sent to the village authorities.

Summary and Conclusions

"As a result of the investigation of this plant and after a careful consideration of the condition of operation, of the results of analyses of effluent from the plant and of the waters from the stream, and of the condition of the stream into which the effluent is discharged, the following summary and conclusions are presented.

(1) That the settling tanks are too small to give proper sedimentation period to the sewage flowing through them.

(2) That with sludge in them as at present operated there is no sedimentation and the sewage passes through them practically unchanged in character.

(3) That the outfall pipe is in a defective condition allowing the sewage at times to overflow at various places through the damaged lamp holes.

(4) That the sewage in its present condition discharging into the river causes the river water to become offensive as shown by the analyses, by the growths of sewage fungi and by its appearance.

Recommendations

In view of the results of this investigation, I would recommend that the village of Stamford be advised to secure the services of an expert to study the situation and design works to properly treat the sewage of the village, these works to take the place of the present inadequate works, and that on completion of the plans they be submitted to this Department for approval as required by the Village and Public Health Laws and that upon receiving this approval the village proceed immediately to the construction of the works.

I would also recommend that, until new works are constructed and put in operation, the following changes be made in the construction and operation of the plant in order that the present works may be operated in a more efficient manner:

(1) That the sedimentation tanks be cleaned out and maintained to give as much sedimentation as is possible.

(2) That the outlet pipe be thoroughly inspected and repaired.

(3) That the area on which sludge is dried be leveled and a bank constructed on the low side so that the sludge cannot flow into the stream."

WESTFIELD

Westfield is an incorporated village in Chautauqua county, located about 1½ miles south of Lake Erie and about 58 miles west of Buffalo. The population of the village has increased slightly during the last few years, there being 2,823 inhabitants in 1905, while at the time of the inspection the population was estimated at about 3,180.

The public water supply is obtained from springs about four miles south of the village. This is a municipal supply and the water after passing through a slow sand filter is supplied to the village by gravity. Practically all of the inhabitants are supplied with the water. There are about 14 miles of sanitary sewers ranging in size from 8 inches to 20 inches. About 40% of the inhabitants are served by the sewer system and disposal works. The sewage flow as determined on the day of inspection was about 288,000 gallons per day, which corresponds to a per capita flow of about 228 gallons. The amount of domestic sewage is increased by the trade wastes from the two grape juice factories in the village and this accounted for the high rate of flow per capita.

The disposal works are located on the east bank of Chautauqua creek, about one mile north of the village and three-quarters of a mile from Lake Erie. The works consist of a grit and screen chamber, two sedimentation tanks, a dosing chamber and four contact filters.

The plant was investigated on August 3 and 4, 1914, and a copy of the report, of which the following conclusions and recommendations are a part, was sent to the village authorities.

Summary and Conclusions

"As a result of the investigation of this plant and after a careful consideration of the condition of operation, of the results of analyses of effluents from the plant and of the condition of the stream into which the effluent is discharged, the following summary and conclusions are presented:

Grit and Screen Chamber:

This chamber is at present maintained in an improper operating condition, owing to the excessive amount of sludge it contains.

The sedimentation tanks are being properly operated and at the time of the inspection effected about 75% reduction in the oxygen consumed value due to the large amount of suspended matter which readily settles. These tanks can be by-passed and this has been done at times, although the construction of this by-pass was forbidden by a specific condition in the permit.

Contact Beds:

These beds are in fair shape and the voids appear to be about 33% of the total capacity of the beds. The beds are too heavily dosed when only three beds are in use and the sewage is retained in the beds too short a time. The sewage in passing through the contact beds showed a reduction of about 30% in the oxygen consumed test and the effluent did not show any nitrates and reduced the methylene blue color in 1½ days.

Sludge Beds:

This bed is too small and sludge is allowed to flow through a pipe in the bank to the river, which is a specific violation of the permit.

Recommendations

In view of the results of this investigation I would recommend that the village of Westfield be requested to arrange for the following changes in the construction and operation of the plant in order that a better effluent may be obtained:

Grit and Screen Chamber:

That the chamber be emptied as soon as any appreciable amount of sludge accumulates or that the sludge be mixed up with the sewage so that it will flow into septic tank.

Sedimentation Tank:

1 That the by-pass around the septic tank be removed so that no sewage may be allowed to flow directly into the river, which is prohibited by the permit.

2 That in cleaning the tanks, only one tank be emptied at a time and the sewage be passed through the other tank at such time.

Contact Beds:

1 That all four beds be used whenever the flow amounts to 200,000 gallons per day or more and if one is shut down for repairs it should be put in use again as soon as possible.

2 That a longer period of contart be allowed.

Sludge Bed:

1 That the present method of disposal of the sludge by allowing it to flow into the creek violates the permit and the sludge bed should be reconstructed by increasing the area of the bed and properly underdraining it and that the existing outlet to the river be sealed up.

2 That the sludge be removed from the sludge bed and disposed of other than by dumping it into the creek.

3 That the sludge bed be fenced off so that the cattle cannot wade through the sludge on the bed."

WHITE PLAINS (Gedney Farm Hotel)

Gedney Farm Hotel is located near White Plains, in Westchester county. It is operated principally during the summer and fall months and has on an average about 200 guests.

The water supply for the hotel is obtained from the public water supply of the village of White Plains. The ground adjacent to the hotel is sewered and the sewers lead to the disposal plant or to a cesspool in the northwest portion of the property. The sewage from the hotel and neighboring buildings, with the exception of three cottages, is all conveyed to the disposal plant.

The sewage disposal works are located about 500 feet west of the hotel and consist of settling tank, dosing tank, two sand filters, sterilzation apparatus, final dosing chamber and two gravel trenches about 250 feet long.

The plant was investigated on July 7, 1914, and a copy of the report, of which the following conclusions and recommendations were a part, was sent to the Gedney Farm Company:

Summary and Conclusions

"As a result of the investigation of this plant and after careful consideration of the conditions of operation and the results of analyses of effluent from the plant and of the stream into which the effluent is discharged the following summary and conclusions are presented:

> The settling tanks are too small to give a proper period of sedimentation for the amount of sewage being treated at the plant and the effluent contains considerable suspended matter. The sand filters present a good appearance on the surface due to the constant raking but give a poor effluent and are overloaded. There seemed to be some small holes or depressions in the sand at the end of the distributing trough and over the drain pipes. The sand is of good effective size but has a high uniformity coefficient. The siphon chambers are in good shape. The sterilization apparatus is rather crude and does not give a constant amount of bleach applied. The bleach used seemed to be of poor quality, probably due to its having been wet and exposed, but is used in large amounts and so gives a good reduction of bacteria. These disposal works were designed and approved and a permit issued for an amount contributed by not over 150 persons and as the actual amount is contributed by from 200 to 300 persons the plant is naturally overtaxed. It is also evident from the series of analyses of the stream that the effect of the discharge of the effluent upon the stream is decidedly variable and that, as the operation of the disposal plant has been carried on, it cannot at all times be depended upon to adequately protect the stream from serious pollution.

Recommendations

I would recommend that the following changes be made in the construction and operation of the plant in order that a high efficiency may be secured:

Settling Tanks:

That the number of people contributing to the disposal works be reduced to 150 or that the capacity of the settling tanks be doubled.

Sand Filters:

1 That the number of people contributing to the disposal works be reduced to 150 or that the area of the sand beds be increased 50% or more. These beds in fact should be doubled in size if the hotel is to accommodate 250 or 300 persons on an average, not considering holidays, instead of 150 persons for which the plant was designed and the permit issued.

2 If it is found in the operation of the filters the sewage in leaving the trough has a tendency to scour out holes in the sand, that a small piece of board be placed under the flow to prevent scouring and that no holes be allowed to form in the sand beds.

3 That the banks on the lower side be carried up higher as shown on the plan to prevent overflow in case the beds do not work properly.

4 That the 4" tile forming a part of the abandoned subsurface irrigation system extending through the north bank of the north bed be removed for 4 or 5 feet and the space be filled with impervious material.

Sterilization Plant:

1 That the bleach be applied in constant amounts instead of varying quantities as at present.

2 That the chloride of lime be stored in a dry place and kept covered from exposure to the weather until ready for use.

In view, therefore, of the above facts, I would further recommend that copies of this report be sent to the Gedney Farm Company and to the Board of Health of the town of White Plains and that the Gedney Farm Company take immediate steps to reduce the number of people contributing to the disposal works to 150 or to enlarge the plant and to make the other changes as recommended. These works are being operated in violation of the permit and if the Gedney Farm Company do not, within a reasonable time, correct these conditions, I would also recommend that the matter be referred to the Attorney-General for action under Section 84 of the Public Health Law for the recovery of the penalties incurred and for an injunction against the continuation of the violation or noncompliance."

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